Coursework_MAP501_2021

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today

Instructions

In this coursework, we will be using several datasets about baseball from the package ‘Lahman’. You can access the list of datasets and all of the variables contained in each one by examining this package in the Packages tab in RStudio.

Please do not change anything in the Preamble section.

Marks are given for each part of each question in the form [C (points for code)+ D (points for discussion)] . To achieve full points for code, code must use tidyverse syntax where possible.

Preamble

```
library("car")
library("MASS")
library("tidyverse")
library("magrittr")
library("here")
library("janitor")
library("lubridate")
library("gridExtra")
library("readxl")
library("glmnet")
library("Lahman")
library("viridis")
library("lindia")
library("lme4")
library("caret")
library("pROC")
```

1. Datasets

a. [3 + 0 points] Create a new dataset called ‘Peopledata’ that contains all of the variables in the ‘People’ dataset by

   i. removing all birth information except birthYear and birthCountry and all death information, along with the variable finalGame;

ii. replacing birthCountry is by bornUSA, a logical variable indicating if the player was born in the USA;

```
#i create new dataset call "Peopledata" and select the variables we need from People dataset
Peopledata <- People %>%
  select(playerID, birthYear, nameFirst, nameLast, weight, height, bats, throws, debut, birth
Country)

#ii replacing the birthCountry column to logical variable, TRUE if born in USA otherwise FALS
E
Peopledata <- Peopledata %>%
  mutate(bornUSA = case_when(
    birthCountry == "USA" ~TRUE,
    birthCountry != "USA" ~FALSE
  )) %>%
  select(-birthCountry)  # remove the column we do not need
```

b. [5 + 0 points] Create new datasets called Battingdata and Fieldingdata by

i. choosing data from the years 1985 and 2015,

ii. selecting only those variables that for those years have fewer than 25 missing cases,

iii. removing the variable ‘G’ from the batting dataset and removing the variables “teamID” and “lgID” from both datasets,

iv. creating a variable in ‘Battingdata’ called batav which is equal to the number of hits (H) over the number of at bats (AB) if the number of hits >0, and =0 if H=0.

```
#i Battingdata
Battingdata <- Batting %>%
  filter(yearID == 1985 | yearID ==2015)  # Filter out the value we want for Battingdata

#ii
Battingdata %>%
  sapply(function(x) sum(is.na(x)))  # Check for variables missing cases. No variable has mis
sing cases

#iii
Battingdata <- Battingdata %>%
  select(-G, -teamID, -lgID)  # Remove the variables that we do not want

#iv
Battingdata <- Battingdata %>%
  mutate(batav = case_when(
    H > 0 ~ H/AB,
    H == 0 ~ 0
    )                        # Create new variable batav
  )

#i Fieldingdata
Fieldingdata <- Fielding %>%
  filter(yearID == 1985 | yearID ==2015)  # Filter out the value we want for Fieldingdata

#ii
Fieldingdata %>%
  sapply(function(x) sum(is.na(x)))  # Check for variables missing cases that are less than 2
5

#iii
Fieldingdata <- Fieldingdata %>%
  select(-PB, -WP, -SB, -CS, -ZR, -teamID, -lgID)  # Remove the variables that we do not want
```

```
playerID   yearID    stint   teamID     lgID        G       AB        R
       0        0        0        0        0        0        0        0
       H      X2B      X3B       HR      RBI       SB       CS       BB
       0        0        0        0        0        0        0        0
      SO      IBB      HBP       SH       SF     GIDP
       0        0        0        0        0        0
playerID   yearID    stint   teamID     lgID      POS        G       GS
       0        0        0        0        0        0        0        0
 InnOuts       PO        A        E       DP       PB       WP       SB
       0        0        0        0        0     2995     3205     2995
      CS       ZR
    2995     3205
```

c. [6 + 0 points] Create a dataset ‘Playerdata’ from the dataset ‘Salaries’ by

   i. selecting data from the years 1985 and 2015,

   ii. adding all distinct variables from the Fieldingdata, Battingdata and Peopledata datasets,

   iii. creating a new variable ‘allstar’ indicating if the player appears anywhere in the AllstarFull dataset,

iv. creating a new variable ‘age’ equal to each player’s age in the relevant year,

v. dropping incomplete cases from the dataset,

vi. dropping unused levels of any categorical variable.

```
# i
Playerdata <- Salaries %>%
  filter(yearID == 1985 | yearID == 2015)  # Filter out the value we want for Playerdata

# ii
Playerdata <- Playerdata %>%
  left_join(Fieldingdata, keep = FALSE) %>%
  left_join(Battingdata, keep = FALSE) %>%
  left_join(Peopledata, keep = FALSE)   # Join Fieldingdata, Battingdata and Peopledata datas
ets

# iii
Playerdata <- Playerdata %>%
  mutate(allstar = playerID %in% AllstarFull$playerID)  # Creating  new variable "allstar"

# iv
Playerdata <- Playerdata %>%
  mutate(age = yearID - birthYear)   # Creating  new variable "age"

# v
Playerdata <- Playerdata %>%
  drop_na()                     # Remove missing value

# vi
Playerdata <- Playerdata %>%
  droplevels()                # Remove levels with 0 value
```

d. [4 + 0 points] Create a dataset called ‘TeamSalaries’ in which there is a row for each team and each year and the variables are:

i. ‘Rostercost’ = the sum of all player salaries for the given team in the given year

ii. ‘meansalary’ = the mean salary for that team that year

iii. ‘rostersize’ = the number of players listed that year for that team.

```
# i
TeamSalaries <- Salaries %>%
  group_by(teamID, yearID) %>%
  mutate(Rostercost = sum(salary))   # Group by team name and year to calculate for new colum
n "Rostercost"

# ii
TeamSalaries <- TeamSalaries %>%
  mutate(meansalary = mean(salary))  # Calculate the average salary for each team in each yea
r

# iii
TeamSalaries <- TeamSalaries %>%
  mutate(rostersize = length(playerID)) %>%  # Create new column for "rostersize"
  select(-lgID, -playerID, -salary) %>%      # Remove the columns we do not need
  ungroup() %>%                              # Ungroup the dataset
  distinct() %>%                             # Remove duplicated value
  arrange(teamID)                            # Arrange it in order
```

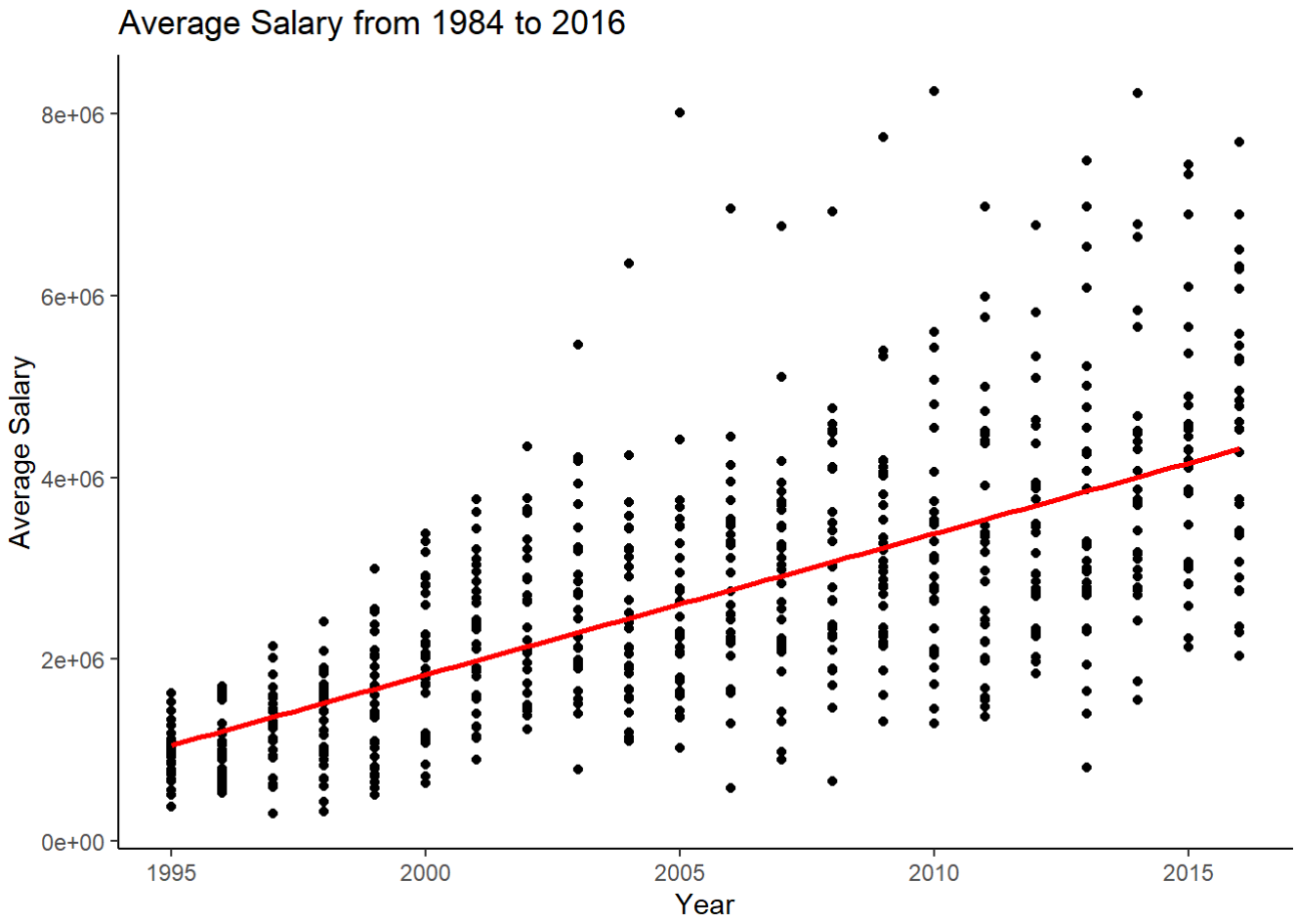
e. [2 + 0 points] Create a dataset ‘Teamdata’ by taking the data from the Teams dataset for the years 1984 to 2016, inclusive and adding to that data the variables in TeamSalaries. Drop any incomplete cases from the dataset.

```
Teamdata <- Teams %>%
  filter(yearID >= 1984 & yearID <= 2016) %>%               # Filter the year we want
  left_join(TeamSalaries, by = c("yearID", "teamID")) %>%   # Join "Teamsalaries" to "Teamdat
a"
  drop_na()                                                 # Remove missing values
```

2. Simple Linear Regression

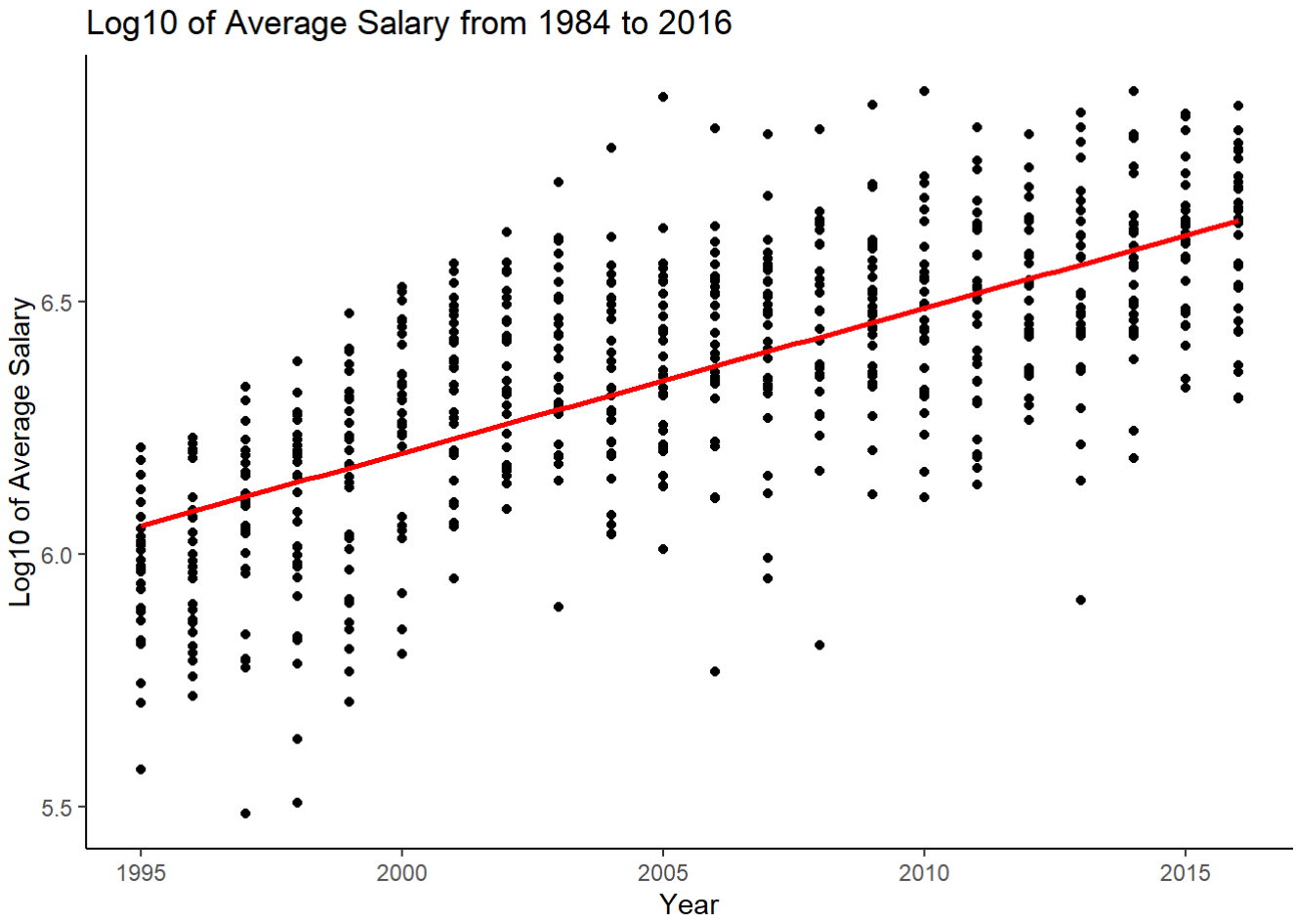
a. [2 + 2 points] Create one plot of mean team salaries over time from 1984 to 2016, and another of the log base 10 of team mean salaries over time from 1984 to 2016. Give two reasons why a linear model is more appropriate for log base 10 mean salaries than for raw mean salaries.

```
Teamdata %>%
  filter(yearID >= 1984 & yearID <= 2016) %>%
  ggplot(aes(yearID, meansalary)) +
  geom_point() +
  labs(x = "Year", y = "Average Salary") +
  ggtitle("Average Salary from 1984 to 2016") +
  geom_smooth(method = "lm", se = FALSE, colour = "red") +
  theme_classic()                                           # Filter out the value we want an
d plot them
```




```
Teamdata <- Teamdata %>%
  mutate(log10_meansalary = log10(meansalary))              # Create a new column for log10 m
eansalary

Teamdata %>%
  filter(yearID >= 1984 & yearID <= 2016) %>%
  ggplot(aes(yearID, log10_meansalary)) +
  geom_point() +
  labs(x = "Year", y = "Log10 of Average Salary") +
  ggtitle("Log10 of Average Salary from 1984 to 2016") +
  geom_smooth(method = "lm", se = FALSE, colour = "red") +
  theme_classic()                                           # Filter out the value we need, a
nd plot with the log10 meansalary
```



Discussion

Through the two plots we created, we can see that the plot with the raw mean salaries is more dispersed after 2005, compare with the log10 mean salaries. We can also see that the data points in the plot with the log10 of mean salaries are more evenly spread along the regression line other than the other plot that has some outliers in some years.

b. [1 + 3 points] Fit a model of log_{10}(meansalary) as a function of yearID. Write the form of the model and explain what the Multiple R-Squared tells us.

```
# Fit the model
linmod_meansalary <- lm(log10_meansalary ~ yearID, data = Teamdata)
summary(linmod_meansalary)
```

```
Call:
lm(formula = log10_meansalary ~ yearID, data = Teamdata)

Residuals:
     Min       1Q   Median       3Q      Max
-0.66345 -0.11692  0.00644  0.13394  0.55976

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -51.222416   2.310867  -22.17   <2e-16 ***
yearID        0.028711   0.001152   24.92   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1858 on 652 degrees of freedom
Multiple R-squared:  0.4878,    Adjusted R-squared:  0.487
F-statistic: 620.9 on 1 and 652 DF,  p-value: < 2.2e-16
```

Discussion

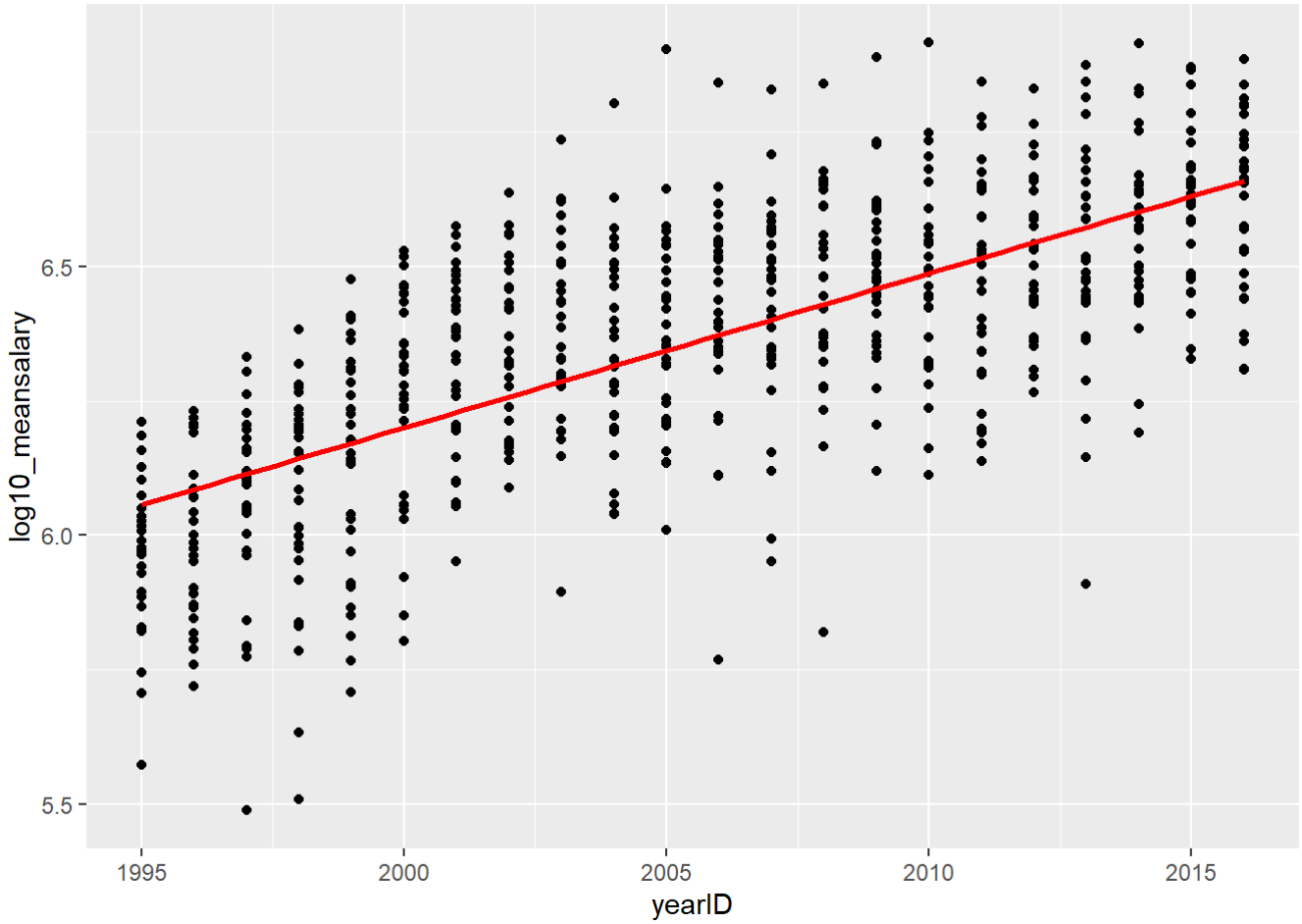
Our model will be:

$$(\log10\_meansalary) \sim N(-51.22 + 0.029 \times (\text{yearID}), 0.1858)$$

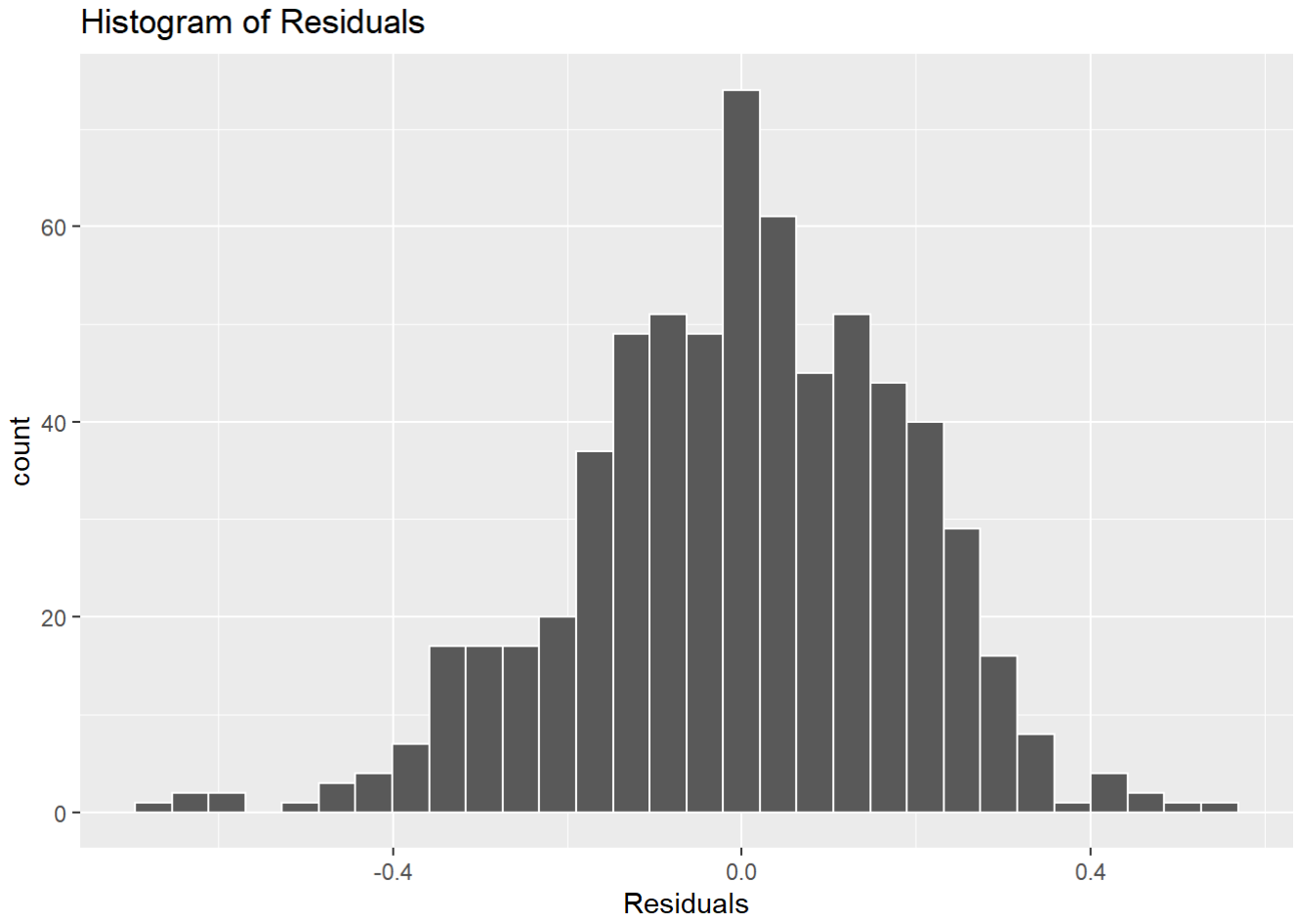
We can see that multiple R-squared value is 0.4878, which means that 48.78% of the variance in log10 mean salaries are explained by differences in different year, so it is kind of explanatory, but there are probably some other uncontrolled variables that are also influential to our response.

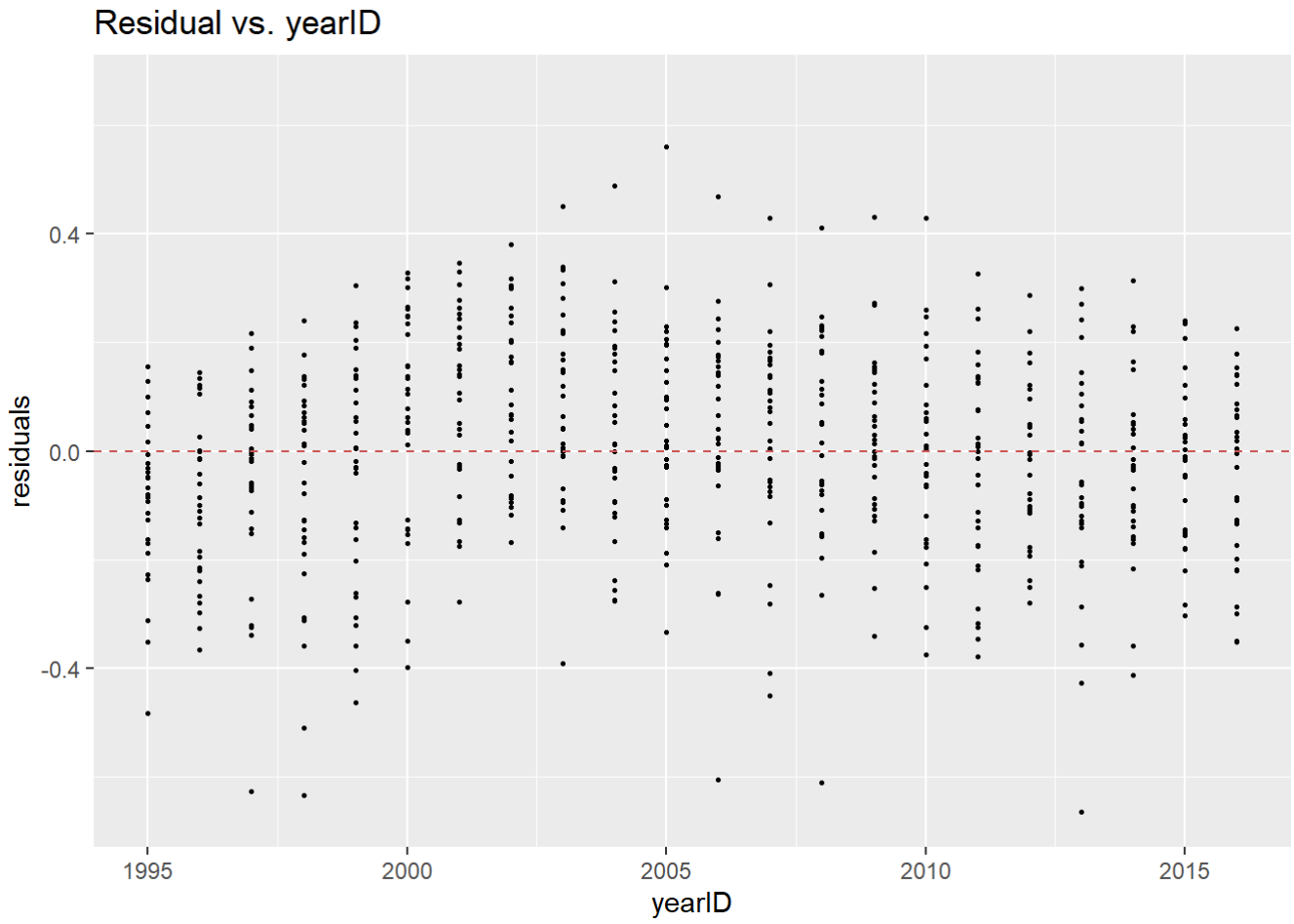
c. [1 + 8 points] State and evaluate the four assumptions of linear models for this data.

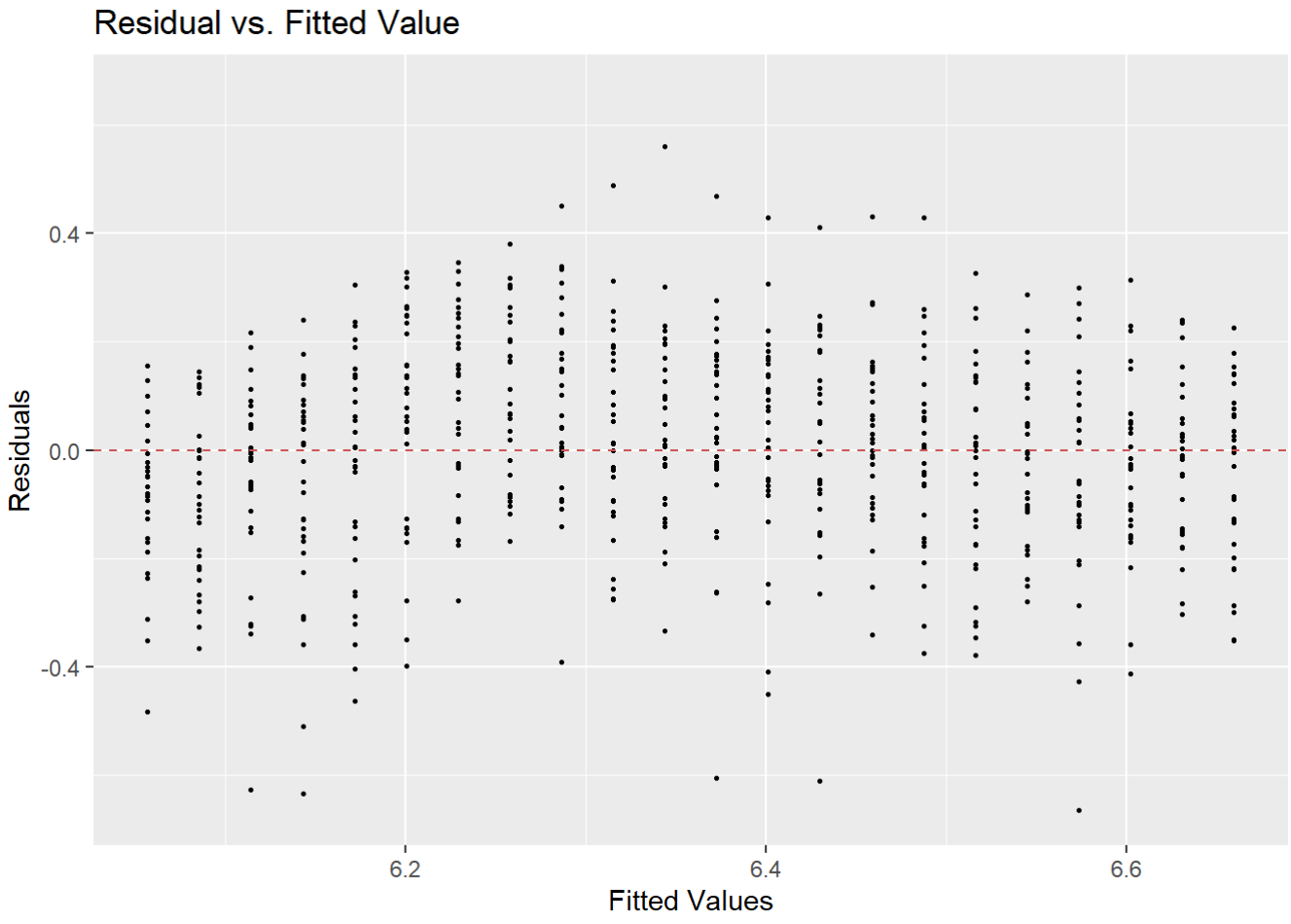
```
Teamdata %>%
  ggplot(mapping = aes(x = yearID, y = log10_meansalary)) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE, colour = "red")
```

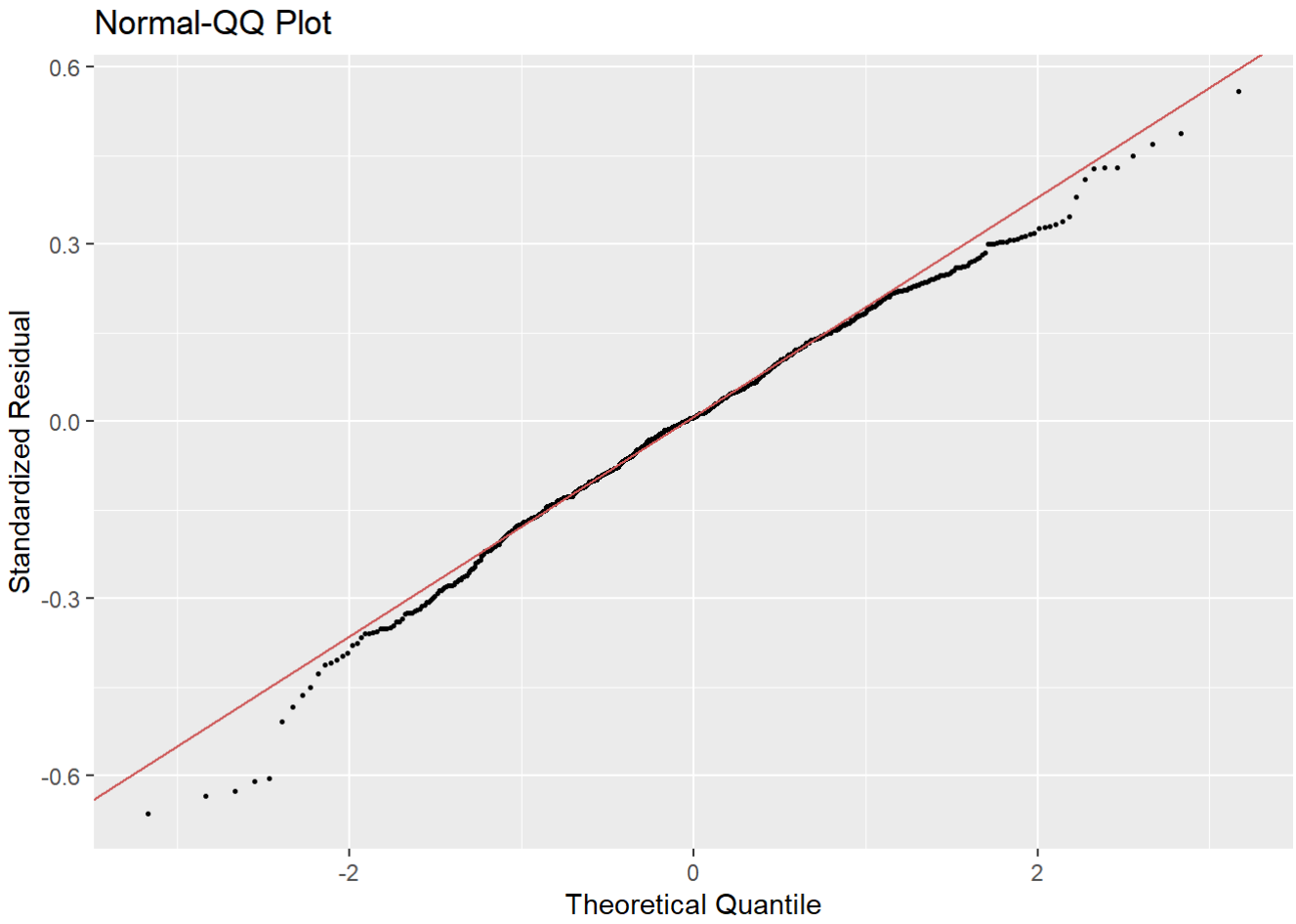


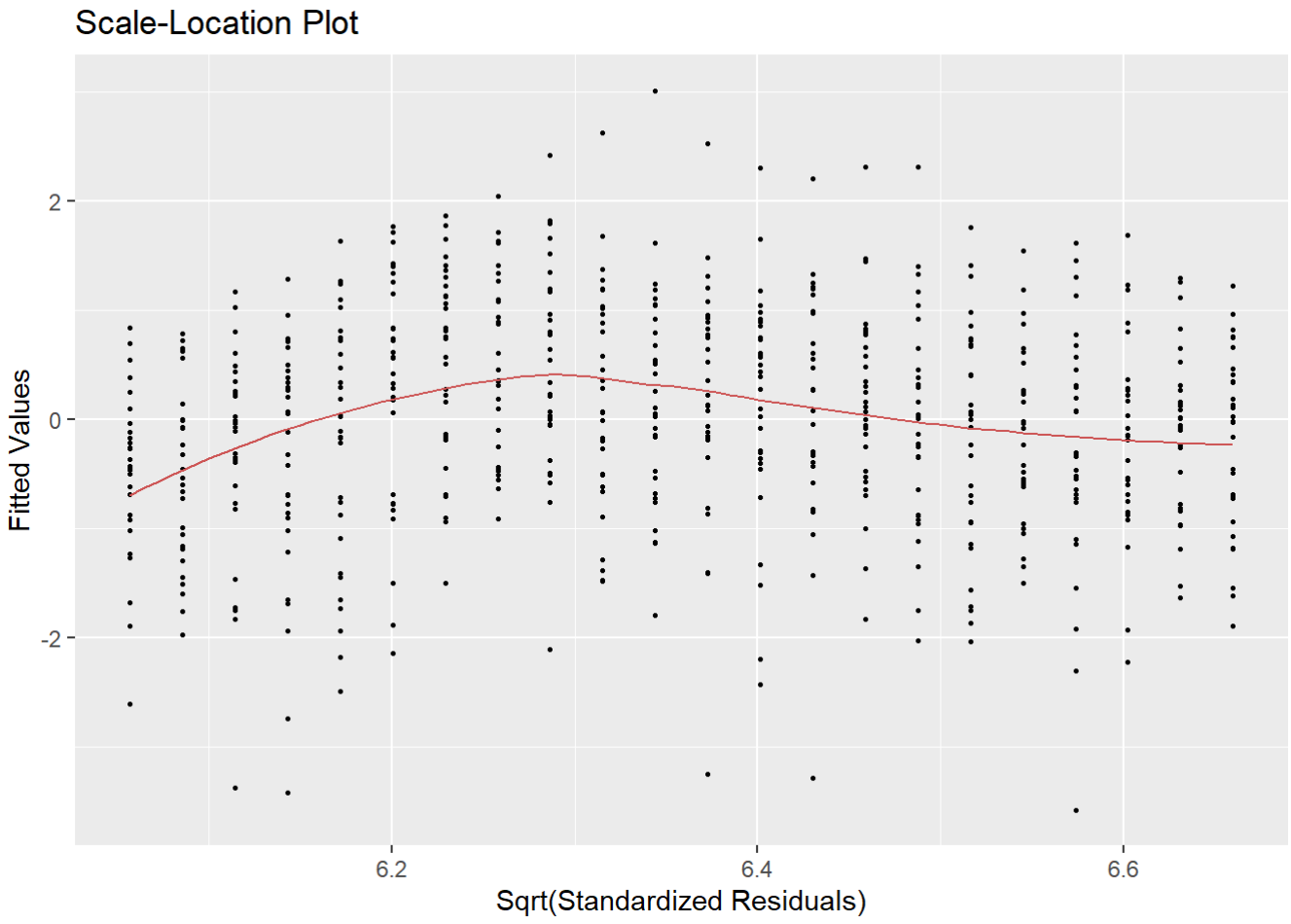

```
linmod_meansalary %>%
  gg_diagnose(max.per.page = 1)
```

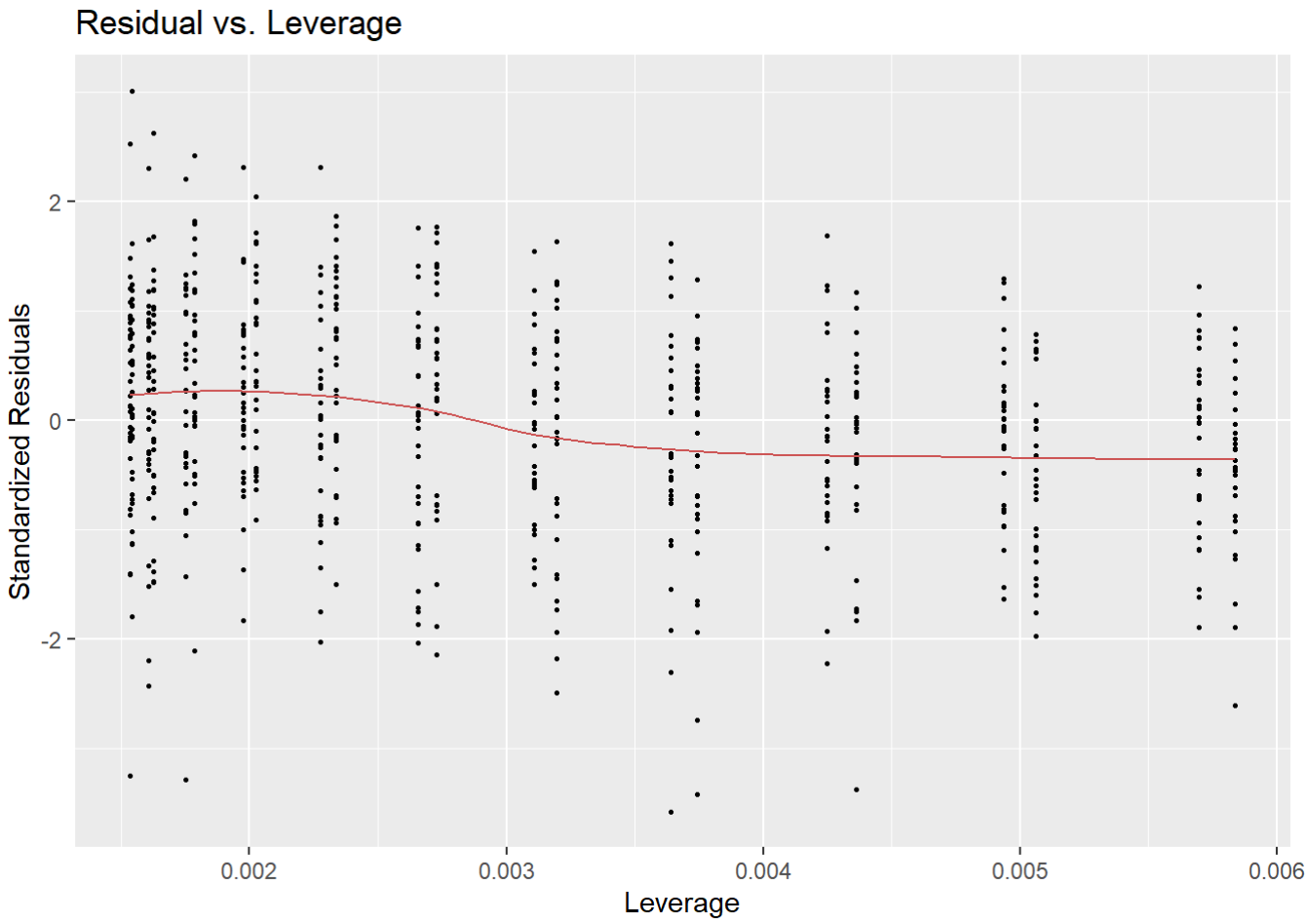


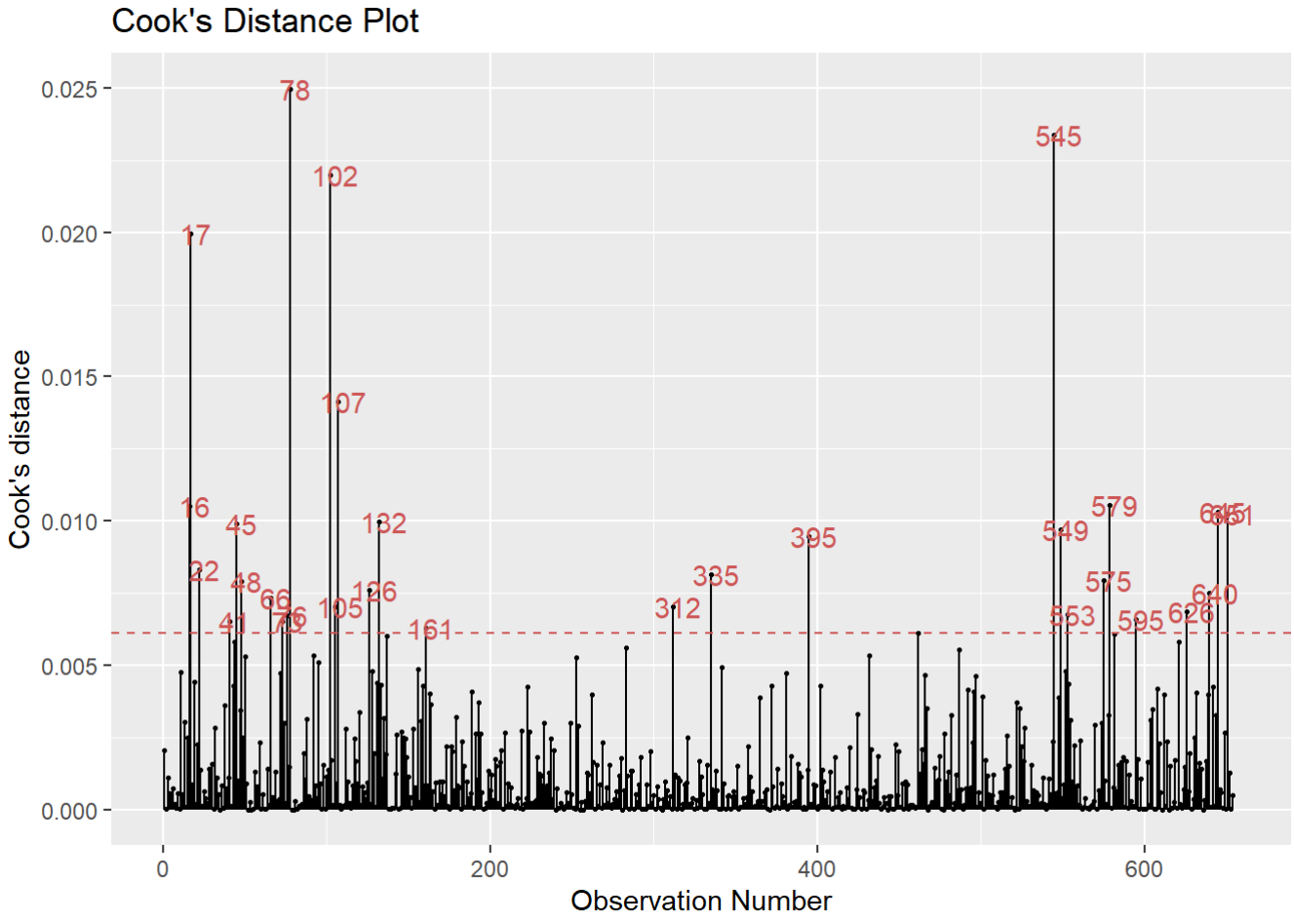

Residual vs. yearID
residuals
0.4
0.0
-0.4
1995
2000
2005
2010
2015
yearID


Residual vs. Fitted Value
Residuals
0.4
0.0
-0.4
6.2
6.4
6.6
Fitted Values


Normal-QQ Plot
Standardized Residual
0.6
0.3
0.0
-0.3
-0.6
-2
0
2
Theoretical Quantile


Scale-Location Plot
Fitted Values
2
0
-2
6.2
6.4
6.6
Sqrt(Standardized Residuals)





Disscussion

To evaluate our model, we will see if the model is reasonable by checking the assumptions below:

1. Linearity: By looking at the scatterplot of log10_meansalary versus yearID, which seems to spread out pretty linearly.
2. Three plots of residuals, Homoscedasticity: By looking at the scatter of residuals versus yearID, which is roughly the same width across the plot and did not show any indication of trend seems pretty good. Normality: By looking at the histogram of residuals, which seems normally distributed as we would like to see. Normality: By looking at the qq plot of residuals, which looks pretty straight as we would like to see.

d. [3 + 1 points] Plot confidence and prediction bands for this model. Colour the points according to who won the World Series each year. Comment on what you find.

```
pred1 <- predict(linmod_meansalary, interval="prediction")  # Compute prediction bands

pred_teamsalary <- cbind(Teamdata,pred1)                    # Add prediction bands to dataset

pred_teamsalary %>%
  ggplot(aes(yearID, log10_meansalary, colour = WSWin)) +
  geom_point(size=2) +
  geom_smooth(method=lm, color='#2C3E50') +
  geom_line(aes(y=lwr), color=2,lty=2) +
  geom_line(aes(y=upr), color=2,lty=2)                    # Plot confidence and prediction ban
d
```

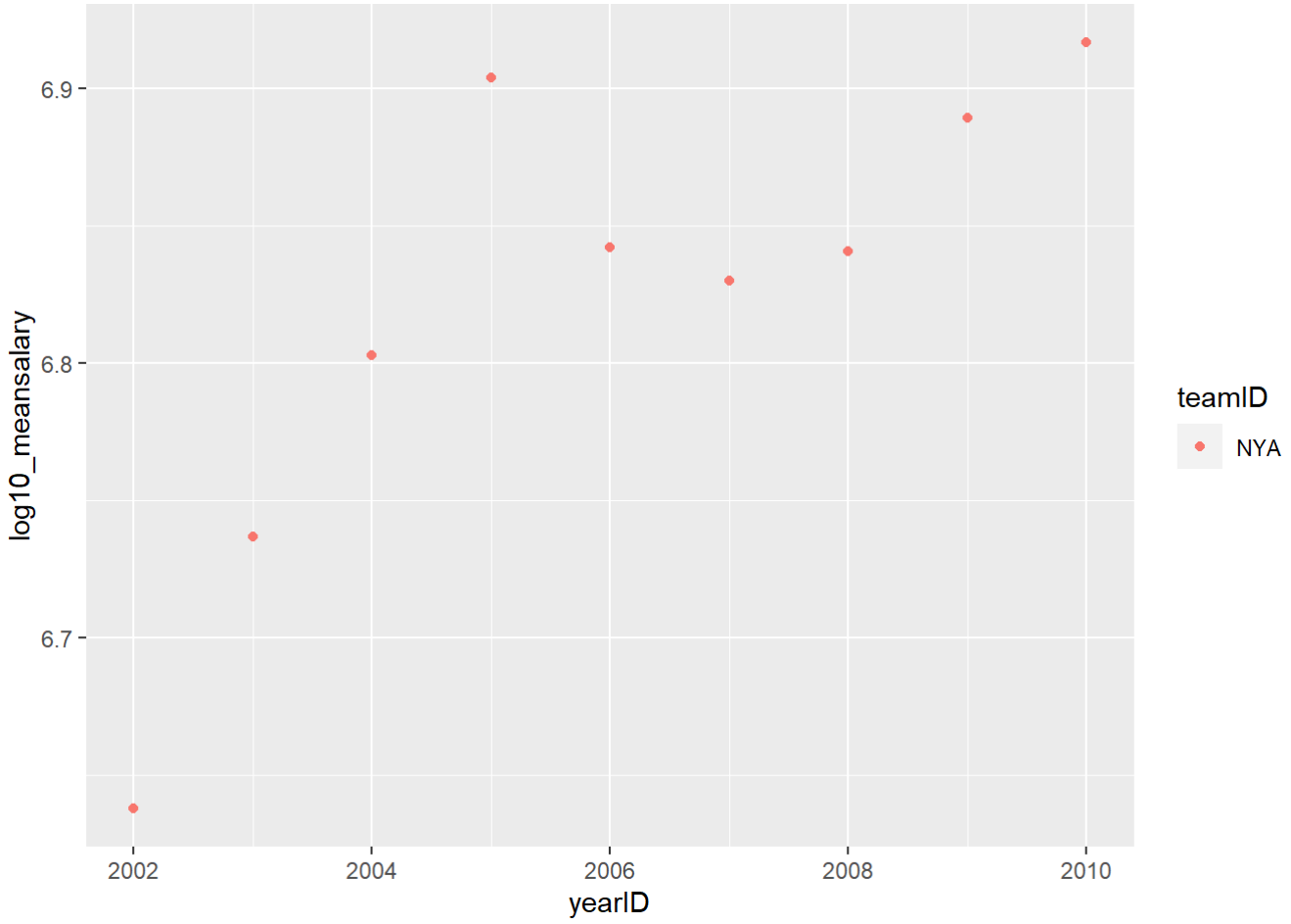
Disscussion

According to the plot, we can see that the confidence interval is quite narrow, which means the uncertainty of the value of the mean is low, this is because we have lot of observation within our population to make the estimate more precise. But the prediction interval is much wider compare to confidence interval, and this is

cause by the variance in the residuals, which means the uncertainty of estimating the mean plus the variance in the population residual is high. We can try excluding the outliers within our data to lower the uncertainty of prediction.

e. [1 + 1 points] Investigate the points that appear above the top prediction band. What team or teams do they relate to?

```
pred_teamsalary %>%
  filter(log10_meansalary > upr) %>%
  distinct(teamID)                          # Filter out the teams that appear above the top pr
ediction band,
                                            # and remove duplicated teamID.
pred_teamsalary %>%
  filter(log10_meansalary > upr) %>%
  ggplot(aes(yearID, log10_meansalary, colour = teamID)) +
  geom_point()                                                  # Can also plot the result to ob
serve.
```




```
    teamID
223    NYA
```

Disscussion

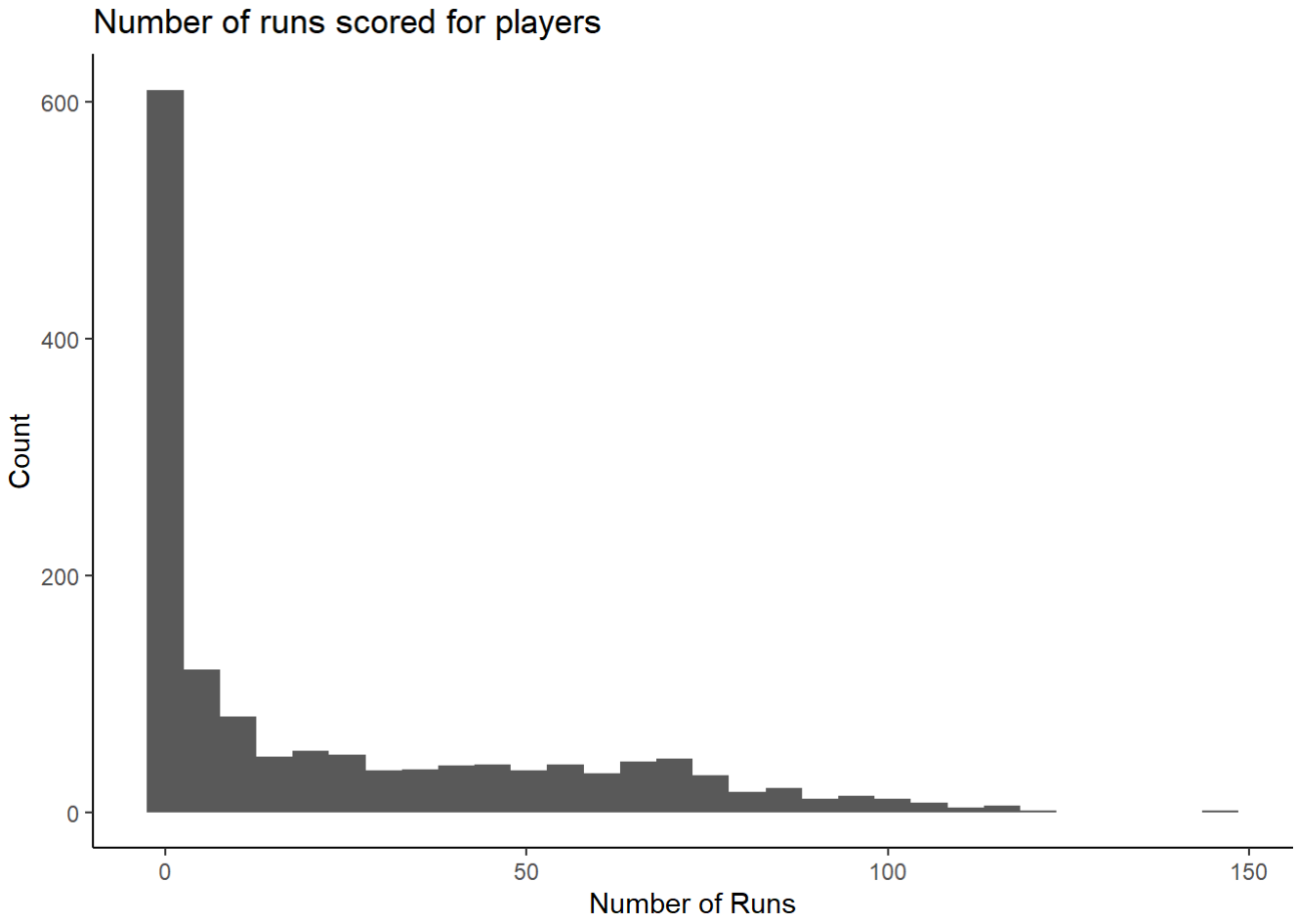
All of the observation that appear above the upper prediction band are from team NYA.

3. Multiple regression for Count Data

a. [2 + 2 points] Create a histogram of the number of runs scored for players in the Playerdata dataset so each bar is a single value (0,1,2 runs, etc). Next create a histogram of the number of runs for all players who have had a hit. Give a domain-based and a data-based reason why it is more reasonable to create a Poisson data for the second set than the first.

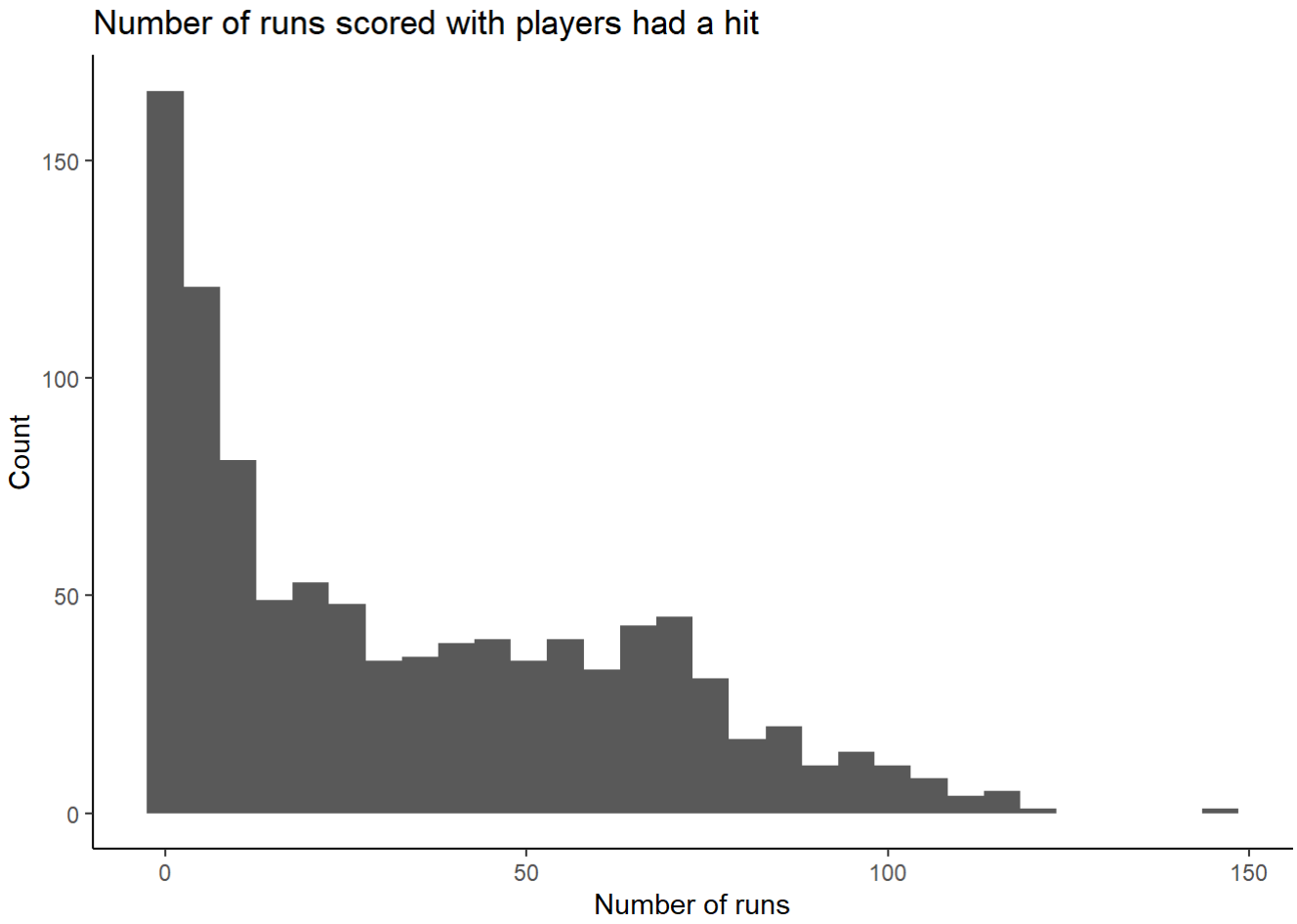
```
playerdata_R <- Playerdata %>%
  select(yearID, playerID, R) %>%
  distinct()                      # Remove duplicated values

playerdata_R %>%
  ggplot(mapping = aes(R)) +
  geom_histogram() +
  labs(x = "Number of Runs", y = "Count") +
  ggtitle("Number of runs scored for players") +
  theme_classic()                 # Plot the result of Earned Runs in Playerdata
```




```
Playerdata_HR <- Playerdata %>%
  select(yearID, playerID, H, R) %>%
  filter(H != 0) %>%
  distinct()                          # Retrieve the data we need and remove duplicated dat
a.

Playerdata_HR %>%
  ggplot(mapping = aes(R)) +
  geom_histogram() +
  labs(x = "Number of runs", y = "Count") +
  ggtitle("Number of runs scored with players had a hit") +
  theme_classic()                     # Plot the result
```



Disscussion

1. Domain-based reason: most of the runs usually occur after hits, it is less likely that a player makes a run without entering the field as a batter hitting the ball first, so if we want to build a model to predict the number of runs, we should include the hit variable as our predictor. As it is correlated with the number of runs.
2. Data-based reason: We can notice from the second plot, the bulk of the data is near zero, with most of the runs around 0-5. And with some other higher number of runs. This is typical of Poisson distributed variables–they are often clustered near zero with long “tails” into higher numbers.

b. [3 + 0 points] Create a new dataset, OnBase of all players who have had at least one hit. Transform yearID to a factor. Construct a Poisson model, glm1, of the number of runs as a function of the number of hits, the year as a factor, position played and player height and age.

```
OnBase <- Playerdata %>%
  filter(H > 0) %>%
  mutate(yearf = as_factor(yearID))                  # Create new dataset for model

glm1 <- glm(R ~ H + yearID + POS + height + age, data = OnBase, family = "poisson")     # Fit
ting the model
summary(glm1)
```

```
Call:
glm(formula = R ~ H + yearID + POS + height + age, family = "poisson",
    data = OnBase)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-9.1745  -1.5840  -0.2634   1.0653   7.9508

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.018e+00  6.379e-01   1.596  0.11048
H            1.285e-02  8.953e-05 143.571  < 2e-16 ***
yearID       7.435e-04  3.095e-04   2.402  0.01629 *
POS2B       -1.152e-02  1.671e-02  -0.689  0.49063
POS3B        5.319e-03  1.574e-02   0.338  0.73535
POSC        -6.297e-02  2.074e-02  -3.036  0.00239 **
POSOF        6.322e-02  1.319e-02   4.792 1.65e-06 ***
POSP        -1.171e+00  3.710e-02 -31.556  < 2e-16 ***
POSSS       -1.123e-02  1.754e-02  -0.640  0.52207
height      -3.584e-03  2.241e-03  -1.599  0.10982
age          4.693e-03  1.202e-03   3.904 9.47e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for poisson family taken to be 1)

    Null deviance: 38805.9  on 1481  degrees of freedom
Residual deviance:  5695.8  on 1471  degrees of freedom
AIC: 12616

Number of Fisher Scoring iterations: 5
```

c. [2 + 4 points] Find the p-value for each of the predictor variables in this model using a Likelihood Ratio Test. What hypothesis does each p-value test, and what mathematically does a p-value tell you about a variable? Use this definition to say what is meant by the p-value associated to POS and to the p-value associated to height.

```
Anova(glm1)
```

```
Analysis of Deviance Table (Type II tests)

Response: R
       LR Chisq Df Pr(>Chisq)
H       21541.0  1  < 2.2e-16 ***
yearID      5.8  1    0.01625 *
POS      1584.5  6  < 2.2e-16 ***
height      2.6  1    0.10994
age        15.2  1  9.705e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Disscussion

POS: This comparison method for models involves analysis of variance(Gaussian models) or deviance(logistic, multinomial, Poisson and quasiPoisson models). The hypothesis is to compare two nested models that one is a “full” model include all variables with the “reduced” model excluding the variable that we are observing. It is a measure of how better a model gets when we exclude the variable. In this case, if the result of p-value is small, this suggests that the full model is better, we should include predictor “POS”. Whereas if it is large, the reduced model without the predictor “POS” is better. From the table we can see the p-value for “POS” is smaller than 2.2e-16, which is much smaller than the usual threshold of 0.05, that means it is significant and is with a large coefficient. Changing this predictor will make a big difference.

Height: The hypothesis is to compare the full model include all variables with the reduced model that excluded predictor “height”. If the result of p-value is small, then it suggests that the predictor “height” is significant. Whereas if the p-value is large then the reduced model without the predictor “height” might be better. From the table we can see the p-values for height is 0.10994, which is greater than the usual threshold of 0.05, that means it is not significant and it is probably not with a large coefficient. Removing this predictor might improve our model.

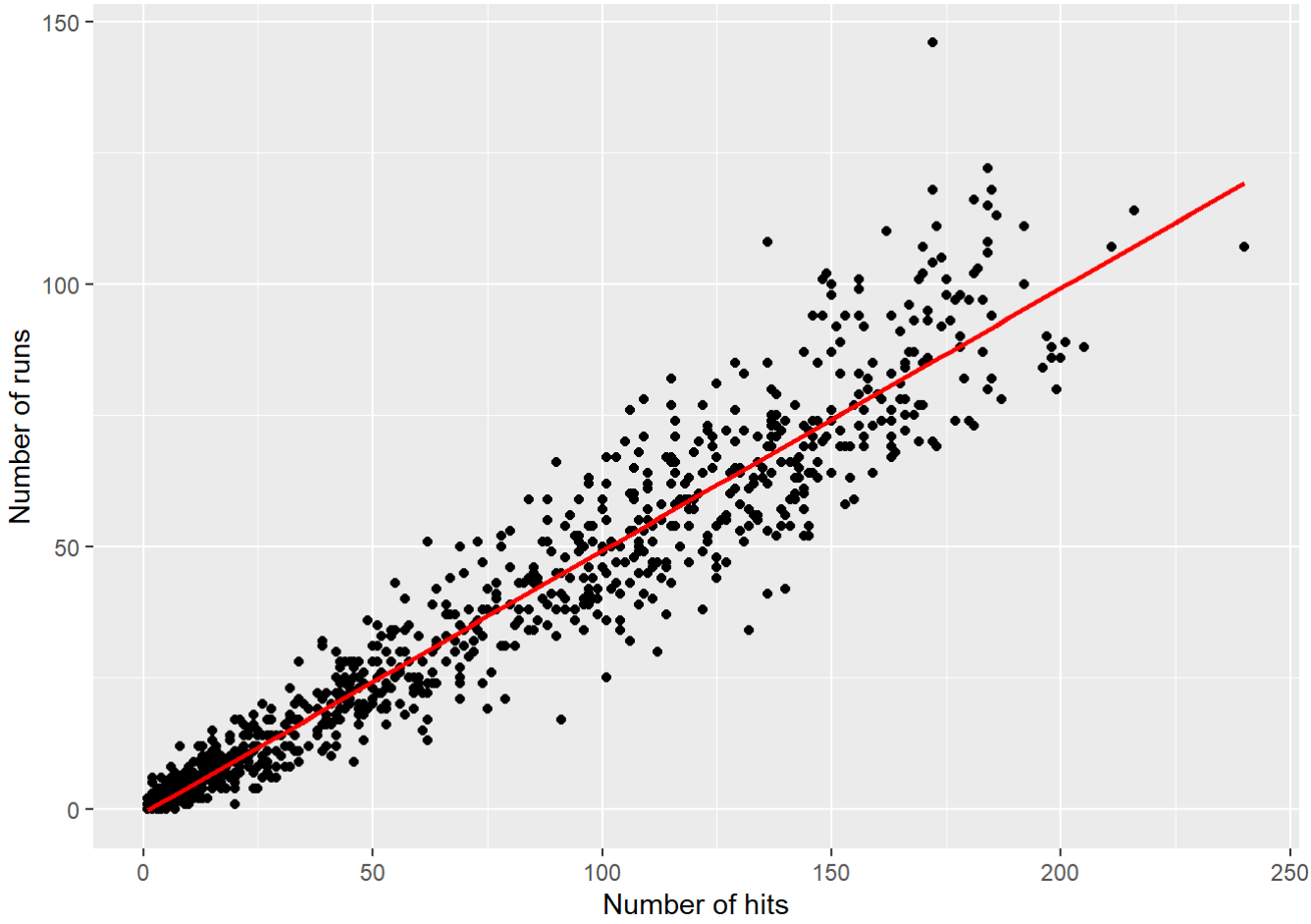
d. [1 + 8 points] State the assumptions of Poisson models and check these where possible.

Disscussion

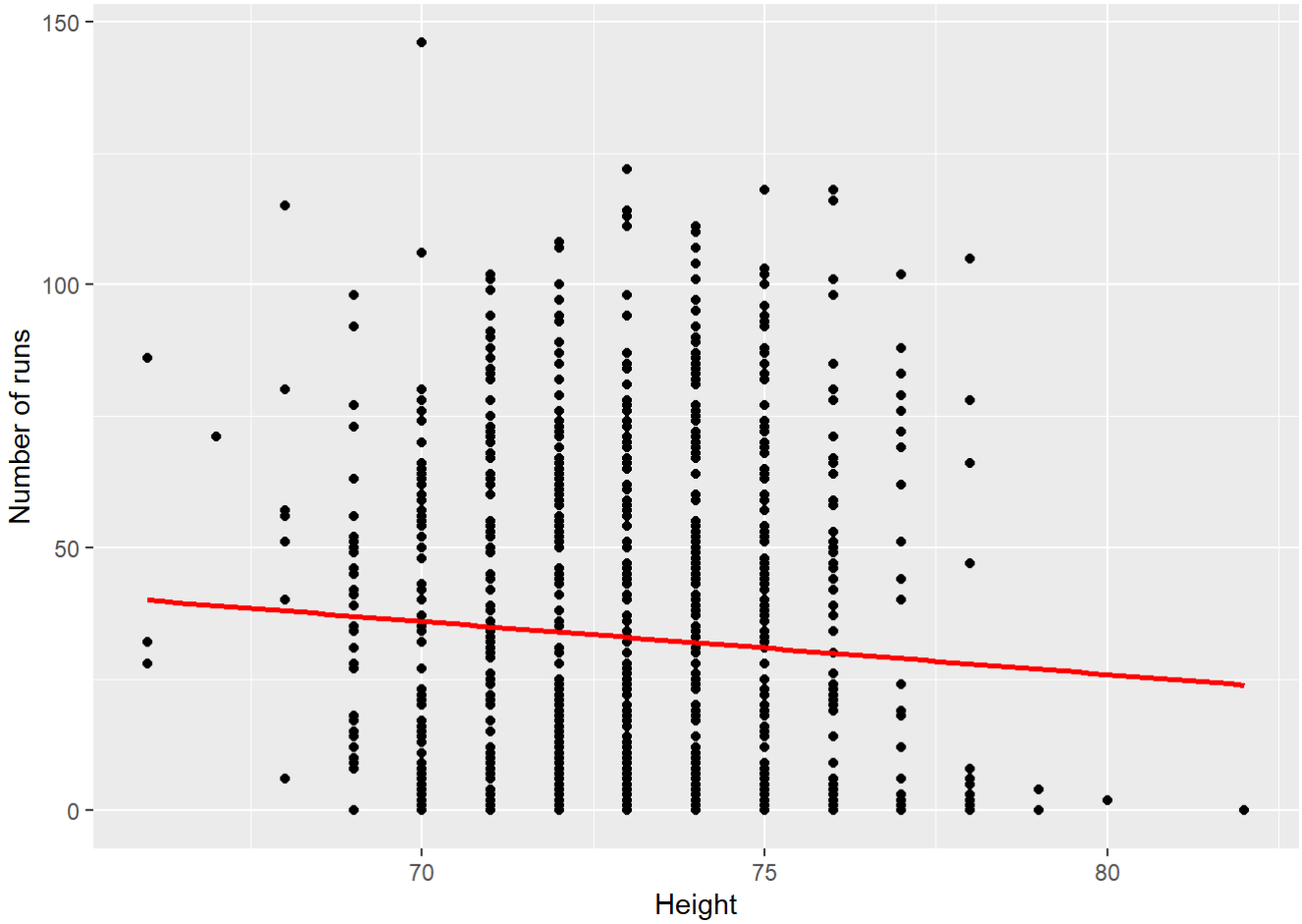
For a poisson model, we’ll check the assumptions below,

Linearity: Here we’ll check the relationship between covariates and response variable is linear.

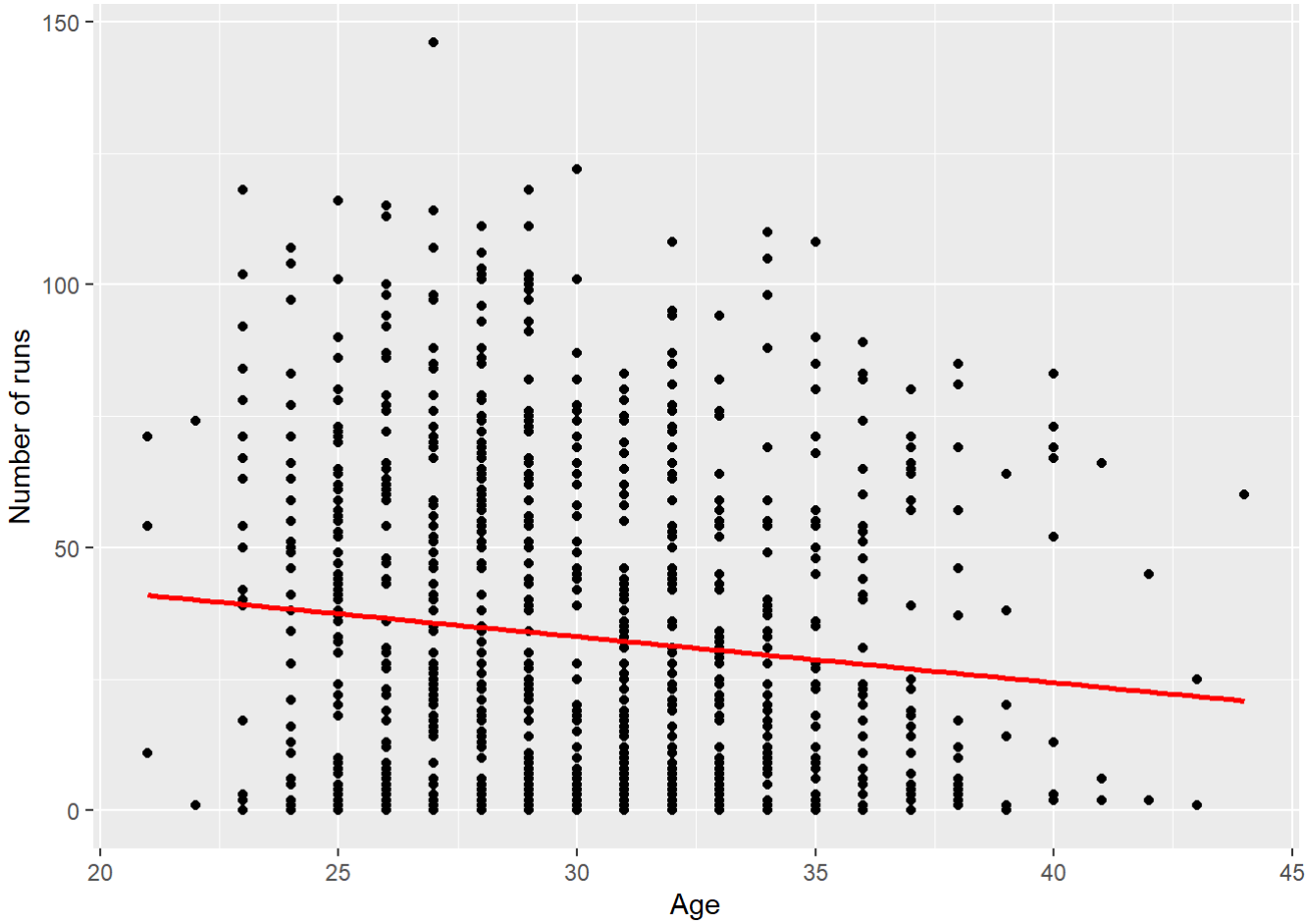
```
plot_1 <- OnBase %>%
  ggplot(aes(H, R)) +
  geom_point() +
  labs(x = "Number of hits", y = "Number of runs") +
  geom_smooth(method = "lm", se = FALSE, colour = "red")
  theme_classic()
plot_1
```




```
plot_2 <- OnBase %>%
  ggplot(aes(height, R)) +
  geom_point() +
  labs(x = "Height", y = "Number of runs") +
  geom_smooth(method = "lm", se = FALSE, colour = "red")
  theme_classic()
plot_2
```




```
plot_3 <- OnBase %>%
  ggplot(aes(age, R)) +
  geom_point() +
  labs(x = "Age", y = "Number of runs") +
  geom_smooth(method = "lm", se = FALSE, colour = "red")
  theme_classic()
plot_3
```


150
100
50
0
Number of runs
20
25
30
35
40
45
Age

```
List of 93
 $ line                       :List of 6
  ..$ colour       : chr "black"
  ..$ size         : num 0.5
  ..$ linetype     : num 1
  ..$ lineend      : chr "butt"
  ..$ arrow        : logi FALSE
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_line" "element"
 $ rect                       :List of 5
  ..$ fill         : chr "white"
  ..$ colour       : chr "black"
  ..$ size         : num 0.5
  ..$ linetype     : num 1
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_rect" "element"
 $ text                       :List of 11
  ..$ family       : chr ""
  ..$ face         : chr "plain"
  ..$ colour       : chr "black"
  ..$ size         : num 11
  ..$ hjust        : num 0.5
  ..$ vjust        : num 0.5
  ..$ angle        : num 0
  ..$ lineheight   : num 0.9
  ..$ margin       : 'margin' num [1:4] 0points 0points 0points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : logi FALSE
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ title                      : NULL
 $ aspect.ratio               : NULL
 $ axis.title                 : NULL
 $ axis.title.x               :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : NULL
  ..$ vjust        : num 1
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 2.75points 0points 0points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ axis.title.x.top           :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : NULL
  ..$ vjust        : num 0
  ..$ angle        : NULL
```

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 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 0points 2.75points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.title.x.bottom       : NULL
$ axis.title.y              :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 1
 ..$ angle        : num 90
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 2.75points 0points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.title.y.left         : NULL
$ axis.title.y.right        :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 0
 ..$ angle        : num -90
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 0points 0points 2.75points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text                 :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : chr "grey30"
 ..$ size         : 'rel' num 0.8
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text.x               :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 1
```

```
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 2.2points 0points 0points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ axis.text.x.top           :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : NULL
  ..$ vjust        : num 0
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 0points 0points 2.2points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ axis.text.x.bottom        : NULL
 $ axis.text.y               :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : num 1
  ..$ vjust        : NULL
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 0points 2.2points 0points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ axis.text.y.left          : NULL
 $ axis.text.y.right         :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : num 0
  ..$ vjust        : NULL
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 0points 0points 0points 2.2points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ axis.ticks                :List of 6
  ..$ colour       : chr "grey20"
  ..$ size         : NULL
  ..$ linetype     : NULL
  ..$ lineend      : NULL
```

```
 ..$ arrow        : logi FALSE
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_line" "element"
$ axis.ticks.x              : NULL
$ axis.ticks.x.top          : NULL
$ axis.ticks.x.bottom       : NULL
$ axis.ticks.y              : NULL
$ axis.ticks.y.left         : NULL
$ axis.ticks.y.right        : NULL
$ axis.ticks.length         : 'simpleUnit' num 2.75points
 ..- attr(*, "unit")= int 8
$ axis.ticks.length.x       : NULL
$ axis.ticks.length.x.top   : NULL
$ axis.ticks.length.x.bottom: NULL
$ axis.ticks.length.y       : NULL
$ axis.ticks.length.y.left  : NULL
$ axis.ticks.length.y.right : NULL
$ axis.line                 :List of 6
 ..$ colour       : chr "black"
 ..$ size         : 'rel' num 1
 ..$ linetype     : NULL
 ..$ lineend      : NULL
 ..$ arrow        : logi FALSE
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_line" "element"
$ axis.line.x               : NULL
$ axis.line.x.top           : NULL
$ axis.line.x.bottom        : NULL
$ axis.line.y               : NULL
$ axis.line.y.left          : NULL
$ axis.line.y.right         : NULL
$ legend.background         :List of 5
 ..$ fill         : NULL
 ..$ colour       : logi NA
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ legend.margin             : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
 ..- attr(*, "unit")= int 8
$ legend.spacing            : 'simpleUnit' num 11points
 ..- attr(*, "unit")= int 8
$ legend.spacing.x          : NULL
$ legend.spacing.y          : NULL
$ legend.key                : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ legend.key.size           : 'simpleUnit' num 1.2lines
 ..- attr(*, "unit")= int 3
$ legend.key.height         : NULL
$ legend.key.width          : NULL
$ legend.text               :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : 'rel' num 0.8
 ..$ hjust        : NULL
```

```
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ legend.text.align         : NULL
$ legend.title              :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : num 0
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ legend.title.align        : NULL
$ legend.position           : chr "right"
$ legend.direction          : NULL
$ legend.justification      : chr "center"
$ legend.box                : NULL
$ legend.box.just           : NULL
$ legend.box.margin         : 'margin' num [1:4] 0cm 0cm 0cm 0cm
 ..- attr(*, "unit")= int 1
$ legend.box.background     : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ legend.box.spacing        : 'simpleUnit' num 11points
 ..- attr(*, "unit")= int 8
$ panel.background          :List of 5
 ..$ fill         : chr "white"
 ..$ colour       : logi NA
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ panel.border              : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ panel.spacing             : 'simpleUnit' num 5.5points
 ..- attr(*, "unit")= int 8
$ panel.spacing.x           : NULL
$ panel.spacing.y           : NULL
$ panel.grid                :List of 6
 ..$ colour       : chr "grey92"
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ lineend      : NULL
 ..$ arrow        : logi FALSE
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_line" "element"
$ panel.grid.major          : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
```

```
 $ panel.grid.minor          : list()
  ..- attr(*, "class")= chr [1:2] "element_blank" "element"
 $ panel.grid.major.x        : NULL
 $ panel.grid.major.y        : NULL
 $ panel.grid.minor.x        : NULL
 $ panel.grid.minor.y        : NULL
 $ panel.ontop               : logi FALSE
 $ plot.background           :List of 5
  ..$ fill         : NULL
  ..$ colour       : chr "white"
  ..$ size         : NULL
  ..$ linetype     : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_rect" "element"
 $ plot.title                :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : 'rel' num 1.2
  ..$ hjust        : num 0
  ..$ vjust        : num 1
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 0points 0points 5.5points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ plot.title.position       : chr "panel"
 $ plot.subtitle             :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : num 0
  ..$ vjust        : num 1
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 0points 0points 5.5points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ plot.caption              :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : 'rel' num 0.8
  ..$ hjust        : num 1
  ..$ vjust        : num 1
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 5.5points 0points 0points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
```

```
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ plot.caption.position     : chr "panel"
$ plot.tag                  :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : 'rel' num 1.2
 ..$ hjust        : num 0.5
 ..$ vjust        : num 0.5
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ plot.tag.position         : chr "topleft"
$ plot.margin               : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
 ..- attr(*, "unit")= int 8
$ strip.background          :List of 5
 ..$ fill         : chr "white"
 ..$ colour       : chr "black"
 ..$ size         : 'rel' num 2
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ strip.background.x        : NULL
$ strip.background.y        : NULL
$ strip.placement           : chr "inside"
$ strip.text                :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : chr "grey10"
 ..$ size         : 'rel' num 0.8
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 4.4points 4.4points 4.4points 4.4points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ strip.text.x              : NULL
$ strip.text.y              :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : num -90
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
```

```
 $ strip.switch.pad.grid     : 'simpleUnit' num 2.75points
  ..- attr(*, "unit")= int 8
 $ strip.switch.pad.wrap     : 'simpleUnit' num 2.75points
  ..- attr(*, "unit")= int 8
 $ strip.text.y.left         :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : NULL
  ..$ vjust        : NULL
  ..$ angle        : num 90
  ..$ lineheight   : NULL
  ..$ margin       : NULL
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 - attr(*, "class")= chr [1:2] "theme" "gg"
 - attr(*, "complete")= logi TRUE
 - attr(*, "validate")= logi TRUE
List of 93
 $ line                      :List of 6
  ..$ colour       : chr "black"
  ..$ size         : num 0.5
  ..$ linetype     : num 1
  ..$ lineend      : chr "butt"
  ..$ arrow        : logi FALSE
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_line" "element"
 $ rect                      :List of 5
  ..$ fill         : chr "white"
  ..$ colour       : chr "black"
  ..$ size         : num 0.5
  ..$ linetype     : num 1
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_rect" "element"
 $ text                      :List of 11
  ..$ family       : chr ""
  ..$ face         : chr "plain"
  ..$ colour       : chr "black"
  ..$ size         : num 11
  ..$ hjust        : num 0.5
  ..$ vjust        : num 0.5
  ..$ angle        : num 0
  ..$ lineheight   : num 0.9
  ..$ margin       : 'margin' num [1:4] 0points 0points 0points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : logi FALSE
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ title                     : NULL
 $ aspect.ratio              : NULL
 $ axis.title                : NULL
 $ axis.title.x              :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
```

```
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : NULL
  ..$ vjust        : num 1
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 2.75points 0points 0points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ axis.title.x.top          :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : NULL
  ..$ vjust        : num 0
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 0points 0points 2.75points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ axis.title.x.bottom       : NULL
 $ axis.title.y              :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : NULL
  ..$ vjust        : num 1
  ..$ angle        : num 90
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 0points 2.75points 0points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ axis.title.y.left         : NULL
 $ axis.title.y.right        :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : NULL
  ..$ vjust        : num 0
  ..$ angle        : num -90
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 0points 0points 0points 2.75points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ axis.text                 :List of 11
```

```
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : chr "grey30"
 ..$ size         : 'rel' num 0.8
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text.x               :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 1
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 2.2points 0points 0points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text.x.top           :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 0
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 0points 2.2points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text.x.bottom        : NULL
$ axis.text.y               :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : num 1
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 2.2points 0points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text.y.left          : NULL
```

```
$ axis.text.y.right         :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : num 0
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 0points 0points 2.2points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.ticks                :List of 6
 ..$ colour       : chr "grey20"
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ lineend      : NULL
 ..$ arrow        : logi FALSE
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_line" "element"
$ axis.ticks.x              : NULL
$ axis.ticks.x.top          : NULL
$ axis.ticks.x.bottom       : NULL
$ axis.ticks.y              : NULL
$ axis.ticks.y.left         : NULL
$ axis.ticks.y.right        : NULL
$ axis.ticks.length         : 'simpleUnit' num 2.75points
 ..- attr(*, "unit")= int 8
$ axis.ticks.length.x       : NULL
$ axis.ticks.length.x.top   : NULL
$ axis.ticks.length.x.bottom: NULL
$ axis.ticks.length.y       : NULL
$ axis.ticks.length.y.left  : NULL
$ axis.ticks.length.y.right : NULL
$ axis.line                 :List of 6
 ..$ colour       : chr "black"
 ..$ size         : 'rel' num 1
 ..$ linetype     : NULL
 ..$ lineend      : NULL
 ..$ arrow        : logi FALSE
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_line" "element"
$ axis.line.x               : NULL
$ axis.line.x.top           : NULL
$ axis.line.x.bottom        : NULL
$ axis.line.y               : NULL
$ axis.line.y.left          : NULL
$ axis.line.y.right         : NULL
$ legend.background         :List of 5
 ..$ fill         : NULL
 ..$ colour       : logi NA
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
```

```
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ legend.margin             : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
 ..- attr(*, "unit")= int 8
$ legend.spacing            : 'simpleUnit' num 11points
 ..- attr(*, "unit")= int 8
$ legend.spacing.x          : NULL
$ legend.spacing.y          : NULL
$ legend.key                : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ legend.key.size           : 'simpleUnit' num 1.2lines
 ..- attr(*, "unit")= int 3
$ legend.key.height         : NULL
$ legend.key.width          : NULL
$ legend.text               :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : 'rel' num 0.8
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ legend.text.align         : NULL
$ legend.title              :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : num 0
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ legend.title.align        : NULL
$ legend.position           : chr "right"
$ legend.direction          : NULL
$ legend.justification      : chr "center"
$ legend.box                : NULL
$ legend.box.just           : NULL
$ legend.box.margin         : 'margin' num [1:4] 0cm 0cm 0cm 0cm
 ..- attr(*, "unit")= int 1
$ legend.box.background     : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ legend.box.spacing        : 'simpleUnit' num 11points
 ..- attr(*, "unit")= int 8
$ panel.background          :List of 5
 ..$ fill         : chr "white"
 ..$ colour       : logi NA
 ..$ size         : NULL
```

```
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ panel.border              : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ panel.spacing             : 'simpleUnit' num 5.5points
 ..- attr(*, "unit")= int 8
$ panel.spacing.x           : NULL
$ panel.spacing.y           : NULL
$ panel.grid                :List of 6
 ..$ colour       : chr "grey92"
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ lineend      : NULL
 ..$ arrow        : logi FALSE
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_line" "element"
$ panel.grid.major          : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ panel.grid.minor          : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ panel.grid.major.x        : NULL
$ panel.grid.major.y        : NULL
$ panel.grid.minor.x        : NULL
$ panel.grid.minor.y        : NULL
$ panel.ontop               : logi FALSE
$ plot.background           :List of 5
 ..$ fill         : NULL
 ..$ colour       : chr "white"
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ plot.title                :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : 'rel' num 1.2
 ..$ hjust        : num 0
 ..$ vjust        : num 1
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 0points 5.5points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ plot.title.position       : chr "panel"
$ plot.subtitle             :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : num 0
 ..$ vjust        : num 1
 ..$ angle        : NULL
```

```
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 0points 5.5points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ plot.caption              :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : 'rel' num 0.8
 ..$ hjust        : num 1
 ..$ vjust        : num 1
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 5.5points 0points 0points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ plot.caption.position     : chr "panel"
$ plot.tag                  :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : 'rel' num 1.2
 ..$ hjust        : num 0.5
 ..$ vjust        : num 0.5
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ plot.tag.position         : chr "topleft"
$ plot.margin               : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
 ..- attr(*, "unit")= int 8
$ strip.background          :List of 5
 ..$ fill         : chr "white"
 ..$ colour       : chr "black"
 ..$ size         : 'rel' num 2
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ strip.background.x        : NULL
$ strip.background.y        : NULL
$ strip.placement           : chr "inside"
$ strip.text                :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : chr "grey10"
 ..$ size         : 'rel' num 0.8
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
```

```
  ..$ margin       : 'margin' num [1:4] 4.4points 4.4points 4.4points 4.4points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ strip.text.x              : NULL
 $ strip.text.y              :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : NULL
  ..$ vjust        : NULL
  ..$ angle        : num -90
  ..$ lineheight   : NULL
  ..$ margin       : NULL
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ strip.switch.pad.grid     : 'simpleUnit' num 2.75points
  ..- attr(*, "unit")= int 8
 $ strip.switch.pad.wrap     : 'simpleUnit' num 2.75points
  ..- attr(*, "unit")= int 8
 $ strip.text.y.left         :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : NULL
  ..$ vjust        : NULL
  ..$ angle        : num 90
  ..$ lineheight   : NULL
  ..$ margin       : NULL
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 - attr(*, "class")= chr [1:2] "theme" "gg"
 - attr(*, "complete")= logi TRUE
 - attr(*, "validate")= logi TRUE
List of 93
 $ line                      :List of 6
  ..$ colour       : chr "black"
  ..$ size         : num 0.5
  ..$ linetype     : num 1
  ..$ lineend      : chr "butt"
  ..$ arrow        : logi FALSE
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_line" "element"
 $ rect                      :List of 5
  ..$ fill         : chr "white"
  ..$ colour       : chr "black"
  ..$ size         : num 0.5
  ..$ linetype     : num 1
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_rect" "element"
 $ text                      :List of 11
```

```
 ..$ family       : chr ""
 ..$ face         : chr "plain"
 ..$ colour       : chr "black"
 ..$ size         : num 11
 ..$ hjust        : num 0.5
 ..$ vjust        : num 0.5
 ..$ angle        : num 0
 ..$ lineheight   : num 0.9
 ..$ margin       : 'margin' num [1:4] 0points 0points 0points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : logi FALSE
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ title                     : NULL
$ aspect.ratio              : NULL
$ axis.title                : NULL
$ axis.title.x              :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 1
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 2.75points 0points 0points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.title.x.top          :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 0
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 0points 2.75points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.title.x.bottom       : NULL
$ axis.title.y              :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 1
 ..$ angle        : num 90
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 2.75points 0points 0points
 .. ..- attr(*, "unit")= int 8
```

```
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.title.y.left         : NULL
$ axis.title.y.right        :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 0
 ..$ angle        : num -90
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 0points 0points 2.75points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text                 :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : chr "grey30"
 ..$ size         : 'rel' num 0.8
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text.x               :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 1
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 2.2points 0points 0points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text.x.top           :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : num 0
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 0points 2.2points 0points
 .. ..- attr(*, "unit")= int 8
```

```
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text.x.bottom        : NULL
$ axis.text.y               :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : num 1
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 2.2points 0points 0points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.text.y.left          : NULL
$ axis.text.y.right         :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : num 0
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 0points 0points 0points 2.2points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ axis.ticks                :List of 6
 ..$ colour       : chr "grey20"
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ lineend      : NULL
 ..$ arrow        : logi FALSE
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_line" "element"
$ axis.ticks.x              : NULL
$ axis.ticks.x.top          : NULL
$ axis.ticks.x.bottom       : NULL
$ axis.ticks.y              : NULL
$ axis.ticks.y.left         : NULL
$ axis.ticks.y.right        : NULL
$ axis.ticks.length         : 'simpleUnit' num 2.75points
 ..- attr(*, "unit")= int 8
$ axis.ticks.length.x       : NULL
$ axis.ticks.length.x.top   : NULL
$ axis.ticks.length.x.bottom: NULL
$ axis.ticks.length.y       : NULL
$ axis.ticks.length.y.left  : NULL
$ axis.ticks.length.y.right : NULL
$ axis.line                 :List of 6
```

```
 ..$ colour       : chr "black"
 ..$ size         : 'rel' num 1
 ..$ linetype     : NULL
 ..$ lineend      : NULL
 ..$ arrow        : logi FALSE
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_line" "element"
$ axis.line.x               : NULL
$ axis.line.x.top           : NULL
$ axis.line.x.bottom        : NULL
$ axis.line.y               : NULL
$ axis.line.y.left          : NULL
$ axis.line.y.right         : NULL
$ legend.background         :List of 5
 ..$ fill         : NULL
 ..$ colour       : logi NA
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ legend.margin             : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
 ..- attr(*, "unit")= int 8
$ legend.spacing            : 'simpleUnit' num 11points
 ..- attr(*, "unit")= int 8
$ legend.spacing.x          : NULL
$ legend.spacing.y          : NULL
$ legend.key                : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ legend.key.size           : 'simpleUnit' num 1.2lines
 ..- attr(*, "unit")= int 3
$ legend.key.height         : NULL
$ legend.key.width          : NULL
$ legend.text               :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : 'rel' num 0.8
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ legend.text.align         : NULL
$ legend.title              :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : num 0
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : NULL
```

```
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ legend.title.align        : NULL
$ legend.position           : chr "right"
$ legend.direction          : NULL
$ legend.justification      : chr "center"
$ legend.box                : NULL
$ legend.box.just           : NULL
$ legend.box.margin         : 'margin' num [1:4] 0cm 0cm 0cm 0cm
 ..- attr(*, "unit")= int 1
$ legend.box.background     : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ legend.box.spacing        : 'simpleUnit' num 11points
 ..- attr(*, "unit")= int 8
$ panel.background          :List of 5
 ..$ fill         : chr "white"
 ..$ colour       : logi NA
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ panel.border              : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ panel.spacing             : 'simpleUnit' num 5.5points
 ..- attr(*, "unit")= int 8
$ panel.spacing.x           : NULL
$ panel.spacing.y           : NULL
$ panel.grid                :List of 6
 ..$ colour       : chr "grey92"
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ lineend      : NULL
 ..$ arrow        : logi FALSE
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_line" "element"
$ panel.grid.major          : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ panel.grid.minor          : list()
 ..- attr(*, "class")= chr [1:2] "element_blank" "element"
$ panel.grid.major.x        : NULL
$ panel.grid.major.y        : NULL
$ panel.grid.minor.x        : NULL
$ panel.grid.minor.y        : NULL
$ panel.ontop               : logi FALSE
$ plot.background           :List of 5
 ..$ fill         : NULL
 ..$ colour       : chr "white"
 ..$ size         : NULL
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ plot.title                :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
```

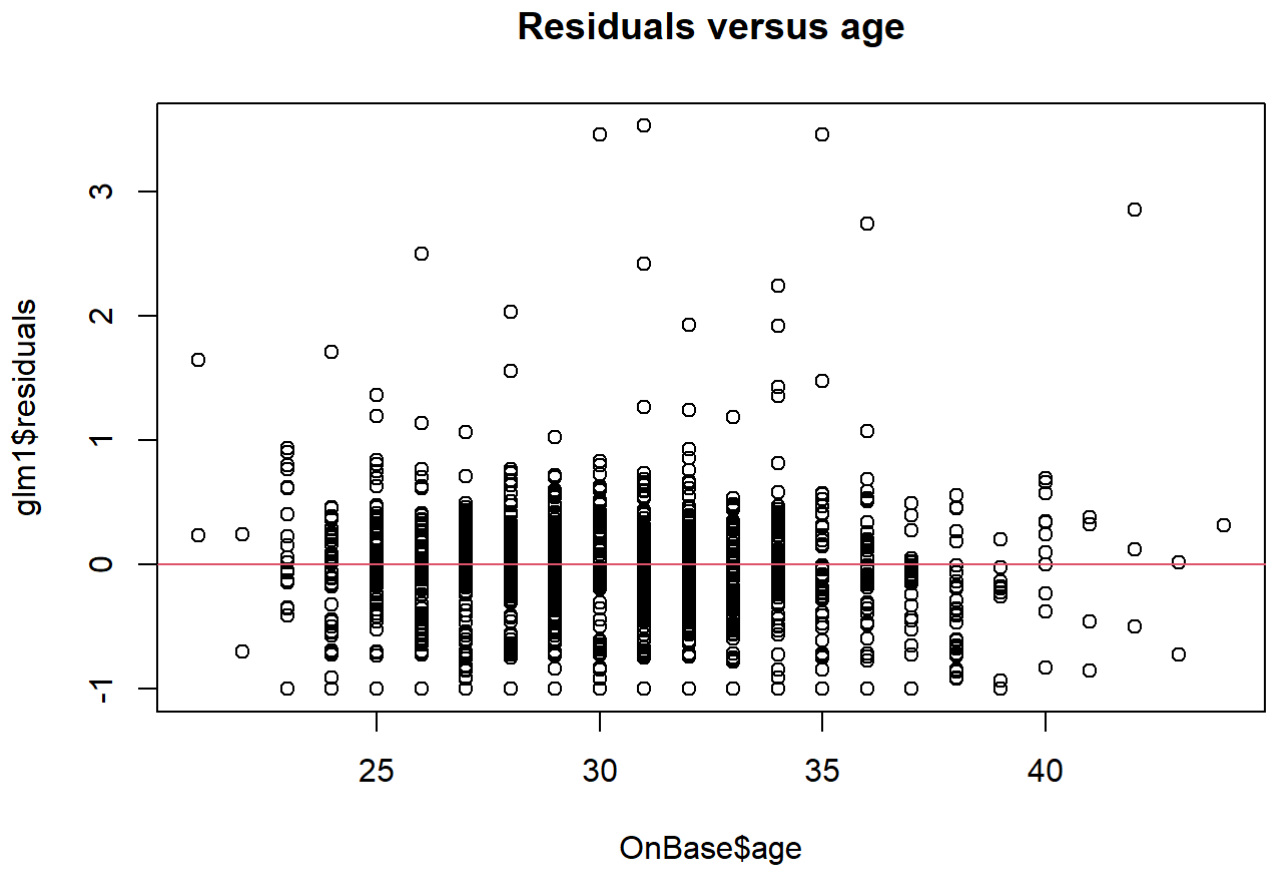
```
  ..$ size         : 'rel' num 1.2
  ..$ hjust        : num 0
  ..$ vjust        : num 1
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 0points 0points 5.5points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ plot.title.position       : chr "panel"
 $ plot.subtitle             :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : NULL
  ..$ hjust        : num 0
  ..$ vjust        : num 1
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 0points 0points 5.5points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ plot.caption              :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : 'rel' num 0.8
  ..$ hjust        : num 1
  ..$ vjust        : num 1
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : 'margin' num [1:4] 5.5points 0points 0points 0points
  .. ..- attr(*, "unit")= int 8
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ plot.caption.position     : chr "panel"
 $ plot.tag                  :List of 11
  ..$ family       : NULL
  ..$ face         : NULL
  ..$ colour       : NULL
  ..$ size         : 'rel' num 1.2
  ..$ hjust        : num 0.5
  ..$ vjust        : num 0.5
  ..$ angle        : NULL
  ..$ lineheight   : NULL
  ..$ margin       : NULL
  ..$ debug        : NULL
  ..$ inherit.blank: logi TRUE
  ..- attr(*, "class")= chr [1:2] "element_text" "element"
 $ plot.tag.position         : chr "topleft"
 $ plot.margin               : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
  ..- attr(*, "unit")= int 8
```

```
$ strip.background          :List of 5
 ..$ fill         : chr "white"
 ..$ colour       : chr "black"
 ..$ size         : 'rel' num 2
 ..$ linetype     : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_rect" "element"
$ strip.background.x        : NULL
$ strip.background.y        : NULL
$ strip.placement           : chr "inside"
$ strip.text                :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : chr "grey10"
 ..$ size         : 'rel' num 0.8
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : NULL
 ..$ lineheight   : NULL
 ..$ margin       : 'margin' num [1:4] 4.4points 4.4points 4.4points 4.4points
 .. ..- attr(*, "unit")= int 8
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ strip.text.x              : NULL
$ strip.text.y              :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : num -90
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
$ strip.switch.pad.grid     : 'simpleUnit' num 2.75points
 ..- attr(*, "unit")= int 8
$ strip.switch.pad.wrap     : 'simpleUnit' num 2.75points
 ..- attr(*, "unit")= int 8
$ strip.text.y.left         :List of 11
 ..$ family       : NULL
 ..$ face         : NULL
 ..$ colour       : NULL
 ..$ size         : NULL
 ..$ hjust        : NULL
 ..$ vjust        : NULL
 ..$ angle        : num 90
 ..$ lineheight   : NULL
 ..$ margin       : NULL
 ..$ debug        : NULL
 ..$ inherit.blank: logi TRUE
 ..- attr(*, "class")= chr [1:2] "element_text" "element"
- attr(*, "class")= chr [1:2] "theme" "gg"
```

```
 - attr(*, "complete")= logi TRUE
 - attr(*, "validate")= logi TRUE
```

Independence: Which means that the residuals do not depend on order in which data was collected. Here we'll check the independence assumption for ordered predictor variables by plotting the time ordered variable against residuals and look for any evidence of snaking.

```
plot(OnBase$age, glm1$residuals, main = "Residuals versus age")
abline(h = 0, col = 2)
```

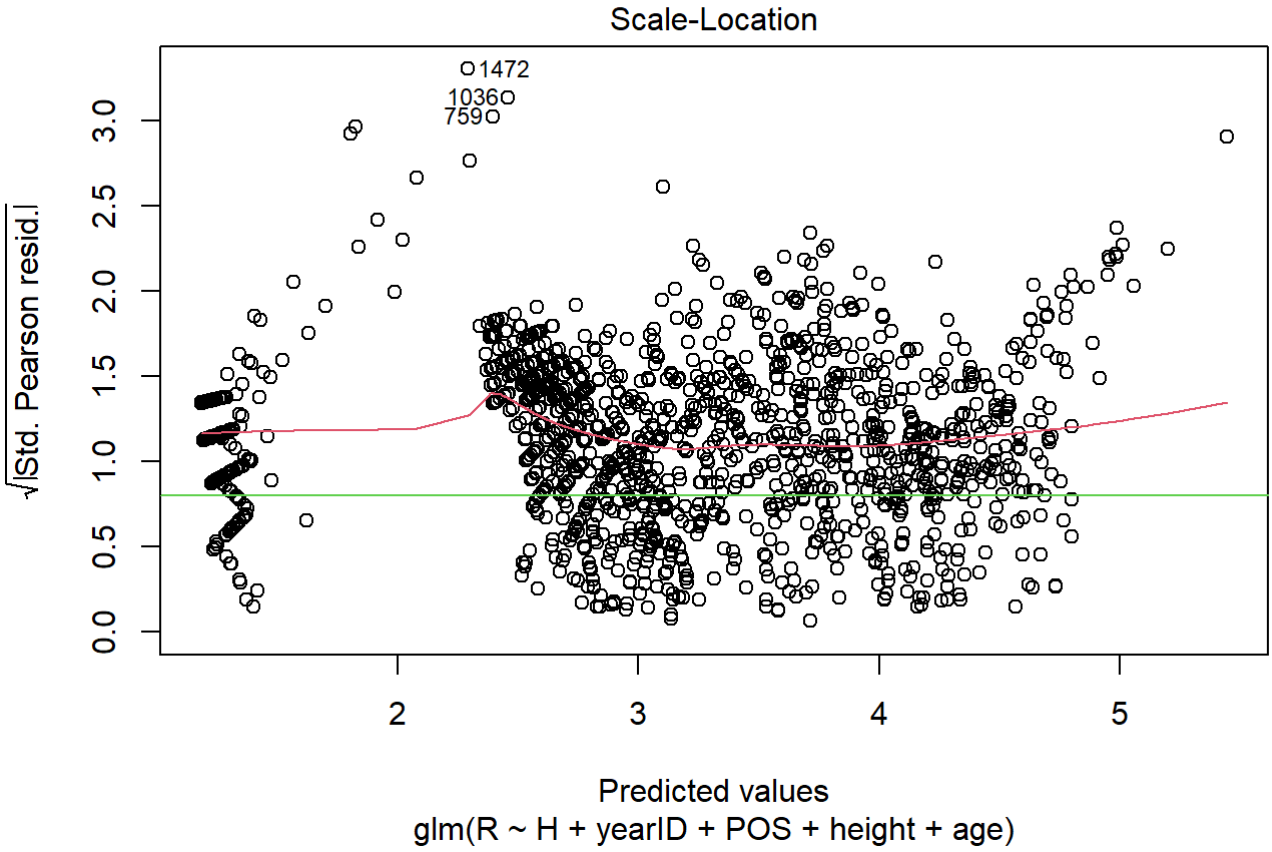


Normality: Here we'll check if the residuals are Poisson distributed by looking at the histogram of residuals.

```
hist(glm1$residuals, breaks = 20)
```

For the assumptions of Poisson models, we want to check if variance=mean is reasonable for this dataset. To do this we will create a plot of the absolute value of residuals versus predicted means, which should look flat, and hover around 0.8 (the green line) as the following plot.

```
plot(glm1, which = 3)
abline(h = 0.8, col = 3)
```



Disscussion

The red line is not flat, and it rises above 0.8. This suggests overdispersion in the data that increases linearly as the prediction increases. Overdispersion is pretty common when we have not accounted for all of the important predictors in our model. In this case, the overdispersion is not great, so we might want to adjust our results.

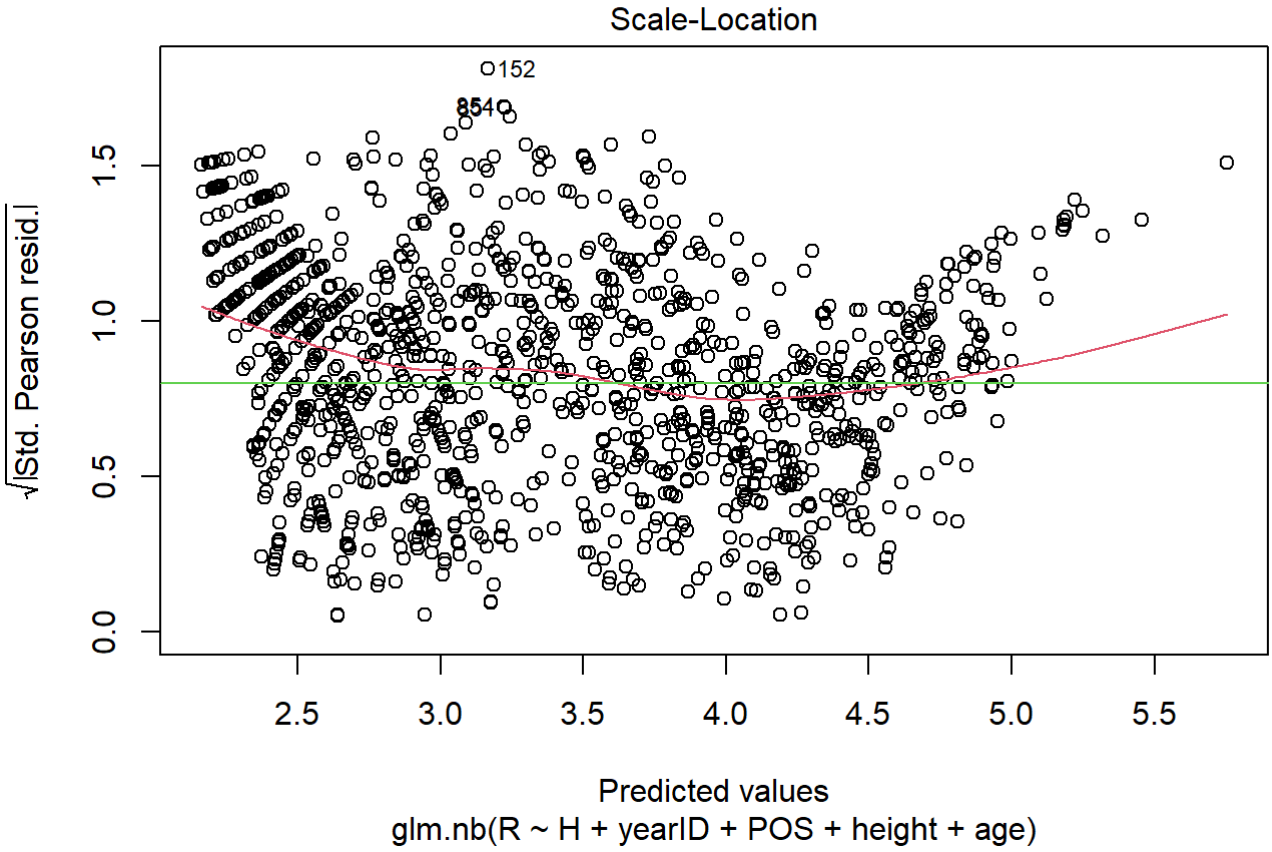
We can also see that the red line looks a bit like an upward parabola, which suggest that a Negative Binomial model might be a better fit. But the values in the left corner which might be players with only one or zero run are weighted down the red line. So we might want to exclude those players and check our plot again.

```
OnBase %>%
  filter(R <= 1) %>%           # Checking which position has runs less or equal to 1
  filter(POS == "P")           # 111 players who are pitchers have o or 1 run only

OnBase %>%                     # There are only 215 pitchers in our dataset, but more than ha
lf of them have 0 or 1 run,
  filter(POS == "P")           # maybe we should try to exclude the pitcher and check if the
 model perform better

# Build a Negative Binomial model which exclude the pitcher
glm2 <- glm.nb(R ~ H + yearID + POS + height + age, data = OnBase[!OnBase$POS == "P",])
summary(glm2)

plot(glm2, which = 3)
abline(h = 0.8, col = 3)       # Plot the result
```


Scale-Location
152
854
√|Std. Pearson resid.|
0.0
0.5
1.0
1.5
2.5
3.0
3.5
4.0
4.5
5.0
5.5
Predicted values
glm.nb(R ~ H + yearID + POS + height + age)

	yearID	teamID	lgID	playerID	salary	stint	POS	G	GS	InnOuts	PO	A	E	DP	AB
1	1985	ATL	NL	campri01	633333	1	P	66	2	383	7	13	4	3	13
2	1985	ATL	NL	dedmoje01	150000	1	P	60	0	258	9	27	2	4	9
3	1985	ATL	NL	garbege01	772000	1	P	59	0	292	11	17	0	1	5
4	1985	ATL	NL	mcmurcr01	275000	1	P	17	6	135	2	12	2	0	14
5	1985	ATL	NL	perezpa01	450000	1	P	22	22	286	7	9	1	0	25
6	1985	CAL	AL	hollaal01	625000	2	P	38	0	176	2	5	0	1	5
7	1985	CHN	NL	brusswa01	375000	1	P	51	0	223	6	3	2	0	7
8	1985	CHN	NL	eckerde01	750000	1	P	25	25	508	10	26	3	1	56
9	1985	CHN	NL	ruthvdi01	766667	1	P	20	15	262	5	11	1	1	24
10	1985	CHN	NL	sandesc01	500000	1	P	19	19	363	11	21	0	2	31
11	1985	CIN	NL	francjo01	75000	1	P	67	0	297	9	21	1	1	6
12	1985	CIN	NL	mcgafan01	110000	1	P	15	15	283	8	12	1	2	29
13	1985	CIN	NL	pastofr01	350000	1	P	17	6	162	3	9	1	1	14
14	1985	CIN	NL	stupejo01	250000	1	P	33	13	297	12	14	0	0	17
15	1985	HOU	NL	dawlebi01	295000	1	P	49	0	243	6	13	1	2	10
16	1985	HOU	NL	dipinfr01	255000	1	P	54	0	228	3	5	1	0	12
17	1985	LAN	NL	niedeto01	370000	1	P	64	0	319	8	7	0	0	9
18	1985	LAN	NL	reussje01	980000	1	P	34	33	638	12	27	3	0	74
19	1985	MON	NL	palmeda01	375000	1	P	24	23	407	17	21	1	3	36
20	1985	MON	NL	reardje01	850000	1	P	63	0	263	9	8	0	0	7
21	1985	NYN	NL	berenbr01	325000	1	P	3	3	41	1	4	0	1	4
22	1985	NYN	NL	lynched01	330000	1	P	31	29	573	15	14	2	2	52
23	1985	NYN	NL	mcdowro01	60000	1	P	62	2	382	17	27	4	2	19
24	1985	NYN	NL	oroscje01	650000	1	P	54	0	237	3	8	1	2	7
25	1985	PHI	NL	grosske01	140000	1	P	38	31	617	18	34	3	0	65
26	1985	PHI	NL	koosmje01	600000	1	P	19	18	298	4	14	1	1	34
27	1985	PIT	NL	deleojo01	155000	1	P	31	25	488	9	16	1	1	36
28	1985	PIT	NL	guantce01	150000	1	P	63	0	327	6	13	1	0	17
29	1985	SDN	NL	hawkian01	200000	1	P	33	33	686	21	30	1	3	77
30	1985	SDN	NL	leffecr01	270000	1	P	60	0	250	4	11	0	1	4
31	1985	SFN	NL	bluevi01	250000	1	P	33	20	393	7	21	2	1	30
32	1985	SFN	NL	davisma01	195000	1	P	77	1	343	2	12	0	0	12
33	1985	SFN	NL	garresc01	85000	1	P	74	0	317	7	22	2	0	9
34	1985	SFN	NL	hammaat01	355000	1	P	29	29	512	6	32	1	1	47
35	1985	SFN	NL	laskebi01	355000	1	P	19	19	342	8	19	2	1	30
36	1985	SFN	NL	laskebi01	355000	2	P	11	7	103	4	7	0	0	7
37	1985	SLN	NL	dayleke01	150000	1	P	57	0	196	5	15	0	0	5
38	1985	SLN	NL	hortori01	110000	1	P	49	3	269	9	21	2	0	16
39	2015	ARI	NL	anderch01	512500	1	P	27	27	458	8	14	2	2	48
40	2015	ARI	NL	corbipa01	524000	1	P	16	16	255	2	18	1	2	25
41	2015	ATL	NL	cahiltr01	12000000	1	P	15	3	79	4	6	0	0	5
42	2015	ATL	NL	foltymi01	508750	1	P	18	15	260	2	5	1	1	28
43	2015	ATL	NL	millesh01	535000	1	P	33	33	616	9	22	5	3	56
44	2015	ATL	NL	teherju01	1000000	1	P	33	33	602	16	30	1	5	52
45	2015	ATL	NL	woodal02	520000	1	P	20	20	358	2	14	2	2	33
46	2015	ATL	NL	woodal02	520000	2	P	12	12	211	2	13	0	1	22
47	2015	BAL	AL	jimenub01	12250000	1	P	32	32	552	7	15	1	1	8
48	2015	BOS	AL	kellyjo05	603000	1	P	25	25	403	20	23	4	1	5
49	2015	BOS	AL	masteju01	9500000	1	P	18	9	178	6	8	1	1	3
50	2015	CHA	AL	salech01	6000000	1	P	31	31	626	7	16	1	1	9
51	2015	CHA	AL	samarje01	9800000	1	P	32	32	642	7	14	0	2	2
52	2015	CHN	NL	beeleda01	508000	1	P	3	3	25	1	2	0	0	3
53	2015	CHN	NL	woodtr01	5686000	1	P	54	9	302	3	7	0	1	30
54	2015	CIN	NL	cuetojo01	10000000	1	P	19	19	392	12	18	0	1	37

55	2015	CIN	NL	desclan01	507500	1	P	31	31	554	14	21	2	0	58
56	2015	CIN	NL	iglesra01	1714286	1	P	18	16	286	12	14	2	1	30
57	2015	CIN	NL	leakemi01	9775000	2	P	9	9	166	2	8	0	1	17
58	2015	CLE	AL	bauertr01	1940000	1	P	31	30	528	12	13	1	3	6
59	2015	CLE	AL	carraca01	2337500	1	P	30	30	551	8	14	0	1	1
60	2015	COL	NL	butleed01	509500	1	P	16	16	238	10	15	4	2	23
61	2015	COL	NL	delarjo01	12500000	1	P	26	26	447	5	22	0	0	48
62	2015	HOU	AL	feldmsc01	10000000	1	P	18	18	325	10	20	2	2	2
63	2015	HOU	AL	keuchda01	524500	1	P	33	33	696	18	53	1	1	5
64	2015	HOU	AL	mchugco01	516300	1	P	32	32	611	13	31	1	1	8
65	2015	KCA	AL	guthrje01	9000000	1	P	30	24	445	13	27	1	0	4
66	2015	KCA	AL	youngch03	675000	1	P	34	18	370	4	10	1	0	4
67	2015	LAA	AL	santihe01	2290000	1	P	33	32	542	4	20	0	3	5
68	2015	LAA	AL	wilsocj01	18000000	1	P	21	21	396	4	20	2	1	6
69	2015	LAN	NL	anderbr04	10000000	1	P	31	31	541	4	47	0	1	47
70	2015	MIA	NL	alvarhe01	4000000	1	P	4	4	67	3	4	1	0	6
71	2015	MIA	NL	cosarja01	540000	1	P	14	13	209	1	19	0	0	17
72	2015	MIA	NL	dunnmi01	2350000	1	P	72	0	162	1	4	0	0	1
73	2015	MIA	NL	handbr01	520000	1	P	38	12	280	2	18	0	1	17
74	2015	MIA	NL	harenda01	10000000	2	P	11	11	175	2	3	0	0	17
75	2015	MIA	NL	latosma01	9400000	1	P	16	16	265	8	10	0	1	18
76	2015	MIA	NL	latosma01	9400000	2	P	6	5	73	3	3	1	0	6
77	2015	MIA	NL	phelpda01	1400000	1	P	23	19	336	4	19	1	2	34
78	2015	MIL	NL	blazemi01	508500	1	P	45	0	167	5	9	1	0	4
79	2015	MIL	NL	fiersmi01	512500	1	P	21	21	354	5	11	4	0	30
80	2015	MIL	NL	garzama01	12500000	1	P	26	25	446	9	16	1	0	39
81	2015	MIL	NL	nelsoji02	511500	1	P	30	30	532	8	21	1	3	55
82	2015	MIL	NL	peralwi01	525500	1	P	20	20	326	11	18	2	1	30
83	2015	MIN	AL	gibsoky01	537500	1	P	32	32	584	16	27	1	3	5
84	2015	MIN	AL	pelfrmi01	5500000	1	P	30	30	494	8	20	0	2	3
85	2015	NYN	NL	geedi01	5300000	1	P	8	7	119	5	10	1	2	10
86	2015	NYN	NL	harvema01	614125	1	P	29	29	568	6	19	2	1	65
87	2015	NYN	NL	torreca01	582125	1	P	59	0	173	5	17	0	1	1
88	2015	OAK	AL	chaveje01	2150000	1	P	30	26	471	10	10	2	0	3
89	2015	OAK	AL	grayso01	512500	1	P	31	31	624	37	23	0	1	6
90	2015	OAK	AL	kazmisc01	13000000	1	P	18	18	329	1	12	2	0	2
91	2015	PHI	NL	defraju01	528000	1	P	61	0	240	10	3	2	1	3
92	2015	PHI	NL	hamelco01	23500000	2	P	12	12	251	5	5	0	1	3
93	2015	PIT	NL	burneaj01	8500000	1	P	26	26	492	11	20	3	1	42
94	2015	PIT	NL	lockeje01	531000	1	P	30	30	505	7	25	0	1	45
95	2015	PIT	NL	mortoch02	8000000	1	P	23	23	387	9	16	2	1	36
96	2015	PIT	NL	worleva01	2450000	1	P	23	8	215	1	14	0	2	17
97	2015	SDN	NL	despaod01	517300	1	P	34	18	377	5	30	0	0	30
98	2015	SEA	AL	happja01	6700000	2	P	11	11	190	2	9	0	0	22
99	2015	SEA	AL	walketa01	513100	1	P	29	29	509	12	19	4	1	9
100	2015	SFN	NL	linceti01	18000000	1	P	15	15	229	3	7	0	0	21
101	2015	SLN	NL	garcija02	9250000	1	P	20	20	389	2	30	2	1	41
102	2015	SLN	NL	lackejo01	507500	1	P	33	33	654	20	15	2	3	62
103	2015	TBA	AL	karnsna01	508800	1	P	27	26	441	5	13	1	0	4
104	2015	TEX	AL	gallayo01	14000000	1	P	33	33	553	17	21	1	2	4
105	2015	TEX	AL	rodriwa01	507000	1	P	17	15	259	3	7	1	0	2
106	2015	TOR	AL	buehrma01	20000000	1	P	32	32	596	11	29	3	4	7
107	2015	TOR	AL	estrama01	3900000	1	P	34	28	543	10	8	1	0	6
108	2015	TOR	AL	norrida01	508700	2	P	8	8	110	3	3	0	1	2
109	2015	WAS	NL	gonzagi01	11000000	1	P	31	31	527	9	32	0	1	43
110	2015	WAS	NL	roarkta01	529600	1	P	40	12	333	9	15	0	3	27

```
111   2015    WAS   NL strasst01  7400000     1   P 23 23     382  3  9 2  0 38
    R  H X2B X3B HR RBI SB CS BB SO IBB HBP SH SF GIDP      batav birthYear
1   1  3   0   0  1   2  0  0  1  5   0   0  1  0    0 0.23076923      1953
2   0  1   0   0  0   1  0  0  1  3   0   0  1  0    0 0.11111111      1960
3   1  1   0   0  0   1  0  0  0  1   0   0  1  0    0 0.20000000      1947
4   0  1   0   0  0   0  0  0  0  7   0   0  1  0    1 0.07142857      1959
5   0  3   0   0  0   1  0  0  3 13   0   0  4  0    0 0.12000000      1957
6   1  2   0   1  0   0  0  0  1  2   0   0  1  0    0 0.40000000      1952
7   0  1   0   0  0   0  0  0  1  5   0   0  0  0    0 0.14285714      1952
8   1  7   0   0  1   1  0  0  7 25   0   0  2  0    0 0.12500000      1954
9   1  5   0   0  0   1  0  1  0  7   0   0  6  0    1 0.20833333      1951
10  1  2   0   0  0   1  0  0  1 17   0   1  6  0    0 0.06451613      1956
11  1  2   0   0  0   1  0  0  0  0   0   0  2  0    0 0.33333333      1960
12  0  1   1   0  0   1  0  0  1 18   0   0  1  0    0 0.03448276      1956
13  1  2   1   0  0   0  0  0  0  6   0   0  2  0    0 0.14285714      1957
14  0  1   0   0  0   1  1  1  3 10   0   0  7  0    0 0.05882353      1957
15  1  2   0   0  0   0  0  0  1  3   0   0  0  0    0 0.20000000      1958
16  1  2   0   0  0   1  0  0  0  7   0   0  0  0    0 0.16666667      1956
17  0  1   0   0  0   0  0  0  0  3   0   0  1  0    0 0.11111111      1959
18  1 10   0   0  0   7  0  0  2 28   0   0  6  1    1 0.13513514      1949
19  1  4   1   0  0   0  0  0  0 10   0   0  5  0    2 0.11111111      1957
20  0  2   0   0  0   1  0  0  0  4   0   0  2  0    0 0.28571429      1955
21  1  1   1   0  0   1  0  0  0  2   0   0  2  0    0 0.25000000      1954
22  1  4   0   0  0   0  0  0  3 30   0   0  9  0    1 0.07692308      1956
23  1  3   1   0  0   1  0  0  1  7   0   0  2  0    0 0.15789474      1960
24  0  3   0   0  0   0  0  0  0  1   0   0  2  0    0 0.42857143      1957
25  1  9   2   0  1   6  0  0  2 23   0   0  8  0    1 0.13846154      1961
26  1  3   0   0  0   4  0  0  1  9   0   0  1  1    2 0.08823529      1942
27  1  2   0   0  0   0  0  0  3 19   0   0  7  0    0 0.05555556      1960
28  0  1   0   0  0   0  0  0  0 12   0   0  0  0    0 0.05882353      1960
29  1  6   0   0  0   3  0  0  3 16   0   0 13  0    1 0.07792208      1960
30  0  1   0   0  0   0  0  0  0  2   0   0  0  0    0 0.25000000      1957
31  0  4   1   0  0   0  0  0  3 12   0   0  8  0    0 0.13333333      1949
32  0  3   0   1  0   0  0  1  0  5   0   0  4  0    0 0.25000000      1960
33  1  2   1   0  0   2  0  0  1  4   0   0  0  0    0 0.22222222      1961
34  0  4   0   0  0   0  0  0  0 17   0   0  6  0    0 0.08510638      1958
35  1  4   0   0  0   1  0  0  3 12   0   1  5  0    0 0.13333333      1957
36  1  1   0   0  0   1  0  0  0  4   0   0  3  0    0 0.14285714      1957
37  0  2   0   0  0   0  0  0  0  1   0   0  0  0    0 0.40000000      1959
38  1  1   0   0  0   0  0  0  3  5   0   0  2  0    0 0.06250000      1959
39  0  5   0   0  0   3  0  0  1 23   0   0  8  0    2 0.10416667      1987
40  1  3   0   0  0   3  0  0  3 11   0   0  1  0    1 0.12000000      1989
41  0  1   0   0  0   0  0  0  0  2   0   0  0  0    0 0.20000000      1988
42  0  2   1   0  0   3  0  0  0 19   0   0  1  1    1 0.07142857      1991
43  1  3   2   0  0   0  0  0  4 29   0   0 11  0    0 0.05357143      1990
44  0  5   0   0  0   2  0  0  2  9   0   0 14  0    0 0.09615385      1991
45  1  5   1   0  0   4  0  0  3 21   0   0  5  0    1 0.15151515      1991
46  1  4   1   0  0   0  0  0  1 13   0   0  3  0    1 0.18181818      1991
47  0  2   0   0  0   2  0  0  0  4   0   0  0  0    0 0.25000000      1984
48  0  1   0   0  0   1  0  0  0  2   0   0  0  0    0 0.20000000      1988
49  0  2   0   0  0   1  0  0  0  1   0   0  0  0    0 0.66666667      1985
50  1  1   0   0  0   0  0  0  0  4   0   0  0  0    0 0.11111111      1989
51  0  1   0   0  0   0  0  0  0  1   0   0  0  0    0 0.50000000      1985
52  0  1   1   0  0   0  0  0  0  1   0   0  0  0    0 0.33333333      1989
53  0  3   0   0  0   2  0  0  2 16   0   0  0  0    0 0.10000000      1987
54  1  6   0   0  0   0  0  0  1 10   0   0  5  0    0 0.16216216      1986
```

55	1	9	1	0	0	3	0	0	3	33	0	0	2	1	0	0.15517241	1990
56	0	2	0	1	0	1	0	0	0	13	0	0	1	0	0	0.06666667	1990
57	1	1	0	0	1	3	0	0	0	11	0	0	0	0	0	0.05882353	1987
58	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0.16666667	1991
59	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	1.00000000	1987
60	0	1	0	0	0	0	0	0	0	13	0	0	1	0	0	0.04347826	1991
61	0	3	0	0	0	3	0	0	0	18	0	0	2	0	1	0.06250000	1981
62	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0.50000000	1983
63	0	1	0	0	0	0	0	0	0	4	0	0	1	0	0	0.20000000	1988
64	1	1	0	0	0	0	0	0	0	4	0	0	0	0	0	0.12500000	1987
65	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0.25000000	1979
66	0	2	0	0	0	3	0	0	0	1	0	0	0	0	0	0.50000000	1979
67	0	1	0	0	0	0	0	0	0	3	0	0	0	0	1	0.20000000	1987
68	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0.33333333	1980
69	1	4	1	0	0	3	0	0	5	32	0	0	9	0	2	0.08510638	1988
70	1	2	1	0	0	1	0	0	0	1	0	0	0	0	0	0.33333333	1990
71	0	1	0	0	0	1	0	0	0	8	0	0	1	0	0	0.05882353	1990
72	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00000000	1985
73	1	2	0	0	0	2	0	0	0	5	0	0	6	0	0	0.11764706	1990
74	1	1	0	0	0	1	0	0	3	4	0	0	2	1	1	0.05882353	1980
75	0	5	0	0	0	1	0	0	0	6	0	0	9	0	0	0.27777778	1987
76	1	2	0	0	0	0	0	0	0	1	0	0	1	0	0	0.33333333	1987
77	0	4	0	0	0	0	0	0	0	16	0	1	5	0	0	0.11764706	1986
78	0	1	1	0	0	1	0	0	0	2	0	0	0	0	0	0.25000000	1989
79	0	3	0	0	0	0	0	0	0	12	0	0	4	0	0	0.10000000	1985
80	0	3	0	0	0	0	0	1	1	21	0	0	7	0	0	0.07692308	1983
81	1	6	1	0	0	2	0	0	1	34	0	0	3	0	0	0.10909091	1989
82	1	1	0	0	0	1	0	0	3	15	0	0	4	0	0	0.03333333	1989
83	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0.20000000	1987
84	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0.66666667	1984
85	0	1	0	0	0	0	0	0	0	5	0	0	2	0	0	0.10000000	1986
86	1	7	2	0	1	7	0	0	0	31	0	0	1	0	2	0.10769231	1989
87	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00000000	1982
88	0	1	0	0	0	0	0	0	0	2	0	0	2	0	0	0.33333333	1983
89	0	1	0	0	0	0	0	0	0	4	0	0	0	0	0	0.16666667	1989
90	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0.50000000	1984
91	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0.33333333	1987
92	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0.33333333	1983
93	1	5	0	0	1	5	0	0	0	20	0	0	9	1	1	0.11904762	1977
94	1	3	1	0	0	2	0	0	2	18	0	0	7	0	1	0.06666667	1987
95	0	1	0	0	0	1	0	0	1	18	0	0	6	0	0	0.02777778	1983
96	1	3	1	0	0	0	0	0	0	6	0	0	1	0	0	0.17647059	1987
97	0	2	1	0	0	0	0	0	1	11	0	0	3	0	1	0.06666667	1987
98	1	2	0	0	0	0	0	0	0	13	0	0	3	0	0	0.09090909	1982
99	0	1	1	0	0	1	0	0	0	5	0	0	1	0	0	0.11111111	1992
100	0	3	1	0	0	0	0	0	2	10	0	0	2	0	1	0.14285714	1984
101	1	4	0	0	0	1	0	0	2	15	0	0	1	0	0	0.09756098	1986
102	0	7	2	0	0	3	0	0	4	24	0	0	4	0	2	0.11290323	1978
103	1	1	0	0	1	1	0	0	0	3	0	0	1	0	0	0.25000000	1987
104	0	2	1	0	0	0	0	0	0	1	0	0	0	0	0	0.50000000	1986
105	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.50000000	1979
106	0	1	0	0	0	0	0	0	1	3	0	0	1	0	0	0.14285714	1979
107	0	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0.33333333	1983
108	1	1	0	0	1	2	0	0	1	1	0	0	0	0	0	0.50000000	1993
109	1	4	1	0	0	2	0	0	1	18	0	2	10	0	1	0.09302326	1985
110	1	5	2	0	0	0	0	0	0	9	0	0	2	0	0	0.18518519	1986

```
111 1  5   0   0  0   0  0  0  2 17   0   0  6  0    0 0.13157895      1988
    nameFirst    nameLast weight height bats throws      debut bornUSA allstar
1        Rick        Camp    195     73    R      R 1976-09-15    TRUE   FALSE
2        Jeff      Dedmon    200     74    L      R 1983-09-02    TRUE   FALSE
3        Gene      Garber    175     70    R      R 1969-06-17    TRUE   FALSE
4       Craig    McMurtry    195     77    R      R 1983-04-10    TRUE   FALSE
5     Pascual       Perez    162     74    R      R 1980-05-07   FALSE    TRUE
6          Al     Holland    207     71    R      L 1977-09-05    TRUE    TRUE
7      Warren    Brusstar    200     75    R      R 1977-05-06    TRUE   FALSE
8      Dennis   Eckersley    190     74    R      R 1975-04-12    TRUE    TRUE
9        Dick     Ruthven    190     75    R      R 1973-04-17    TRUE    TRUE
10      Scott   Sanderson    195     77    R      R 1978-08-06    TRUE    TRUE
11       John      Franco    170     70    L      L 1984-04-24    TRUE    TRUE
12       Andy  McGaffigan    185     75    R      R 1981-09-22    TRUE   FALSE
13      Frank     Pastore    188     74    R      R 1979-04-04    TRUE   FALSE
14       John      Stuper    200     74    R      R 1982-06-01    TRUE   FALSE
15       Bill      Dawley    235     77    R      R 1983-04-15    TRUE    TRUE
16      Frank      DiPino    175     70    L      L 1981-09-14    TRUE   FALSE
17        Tom  Niedenfuer    225     77    R      R 1981-08-15    TRUE   FALSE
18      Jerry       Reuss    200     77    L      L 1969-09-27    TRUE    TRUE
19      David      Palmer    195     73    R      R 1978-09-09    TRUE   FALSE
20       Jeff     Reardon    190     72    R      R 1979-08-25    TRUE    TRUE
21      Bruce     Berenyi    205     75    R      R 1980-07-05    TRUE   FALSE
22         Ed       Lynch    230     78    R      R 1980-08-31    TRUE   FALSE
23      Roger    McDowell    175     73    R      R 1985-04-11    TRUE   FALSE
24      Jesse      Orosco    174     74    R      L 1979-04-05    TRUE    TRUE
25      Kevin       Gross    203     77    R      R 1983-06-25    TRUE    TRUE
26      Jerry     Koosman    205     74    R      L 1967-04-14    TRUE    TRUE
27       Jose      DeLeon    210     75    R      R 1983-07-23   FALSE   FALSE
28    Cecilio      Guante    200     75    R      R 1982-05-01   FALSE   FALSE
29       Andy     Hawkins    200     76    R      R 1982-07-17    TRUE   FALSE
30      Craig    Lefferts    180     73    L      L 1983-04-07   FALSE   FALSE
31       Vida        Blue    189     72    B      L 1969-07-20    TRUE    TRUE
32       Mark       Davis    180     75    L      L 1980-09-12    TRUE    TRUE
33      Scott    Garrelts    195     76    R      R 1982-10-02    TRUE    TRUE
34      Atlee    Hammaker    200     75    B      L 1981-08-13    TRUE    TRUE
35       Bill      Laskey    190     77    R      R 1982-04-23    TRUE   FALSE
36       Bill      Laskey    190     77    R      R 1982-04-23    TRUE   FALSE
37        Ken      Dayley    171     72    L      L 1982-05-13    TRUE   FALSE
38      Ricky      Horton    195     74    L      L 1984-04-07    TRUE   FALSE
39      Chase    Anderson    210     73    R      R 2014-05-11    TRUE   FALSE
40    Patrick      Corbin    210     75    L      L 2012-04-30    TRUE    TRUE
41     Trevor      Cahill    223     76    R      R 2009-04-07    TRUE    TRUE
42       Mike Foltynewicz    195     76    R      R 2014-08-02    TRUE    TRUE
43     Shelby      Miller    225     75    R      R 2012-09-05    TRUE    TRUE
44      Julio     Teheran    205     74    R      R 2011-05-07   FALSE    TRUE
45       Alex        Wood    215     76    R      L 2013-05-30    TRUE    TRUE
46       Alex        Wood    215     76    R      L 2013-05-30    TRUE    TRUE
47     Ubaldo     Jimenez    221     77    R      R 2006-09-26   FALSE    TRUE
48        Joe       Kelly    174     73    R      R 2012-06-10    TRUE   FALSE
49     Justin   Masterson    260     78    R      R 2008-04-24   FALSE    TRUE
50      Chris        Sale    183     78    L      L 2010-08-06    TRUE    TRUE
51       Jeff  Samardzija    233     76    R      R 2008-07-25    TRUE    TRUE
52     Dallas      Beeler    225     77    R      R 2014-06-28    TRUE   FALSE
53     Travis        Wood    175     71    R      L 2010-07-01    TRUE    TRUE
54     Johnny       Cueto    229     71    R      R 2008-04-03   FALSE    TRUE
```

55	Anthony	DeSclafani	195	74	R	R	2014-05-14	TRUE	FALSE
56	Raisel	Iglesias	190	74	R	R	2015-04-12	FALSE	FALSE
57	Mike	Leake	165	70	R	R	2010-04-11	TRUE	FALSE
58	Trevor	Bauer	205	73	R	R	2012-06-28	TRUE	TRUE
59	Carlos	Carrasco	224	76	R	R	2009-09-01	FALSE	FALSE
60	Eddie	Butler	180	74	R	R	2014-06-06	TRUE	FALSE
61	Jorge	De La Rosa	215	73	L	L	2004-08-14	FALSE	FALSE
62	Scott	Feldman	225	78	L	R	2005-08-31	TRUE	FALSE
63	Dallas	Keuchel	220	74	L	L	2012-06-17	TRUE	TRUE
64	Collin	McHugh	191	74	R	R	2012-08-23	TRUE	FALSE
65	Jeremy	Guthrie	205	73	R	R	2004-08-28	TRUE	FALSE
66	Chris	Young	255	82	R	R	2004-08-24	TRUE	TRUE
67	Hector	Santiago	215	72	R	L	2011-07-06	TRUE	TRUE
68	C. J.	Wilson	210	73	L	L	2005-06-10	TRUE	TRUE
69	Brett	Anderson	230	76	L	L	2009-04-10	TRUE	FALSE
70	Henderson	Alvarez	205	72	R	R	2011-08-10	FALSE	TRUE
71	Jarred	Cosart	206	75	R	R	2013-07-12	TRUE	FALSE
72	Mike	Dunn	212	72	L	L	2009-09-04	TRUE	FALSE
73	Brad	Hand	215	75	L	L	2011-06-07	TRUE	TRUE
74	Dan	Haren	215	77	R	R	2003-06-30	TRUE	TRUE
75	Mat	Latos	245	78	R	R	2009-07-19	TRUE	FALSE
76	Mat	Latos	245	78	R	R	2009-07-19	TRUE	FALSE
77	David	Phelps	198	74	R	R	2012-04-08	TRUE	FALSE
78	Michael	Blazek	205	72	R	R	2013-06-22	TRUE	FALSE
79	Mike	Fiers	211	74	R	R	2011-09-14	TRUE	FALSE
80	Matt	Garza	220	76	R	R	2006-08-11	TRUE	FALSE
81	Jimmy	Nelson	250	78	R	R	2013-09-06	TRUE	FALSE
82	Wily	Peralta	255	73	R	R	2012-04-22	FALSE	FALSE
83	Kyle	Gibson	215	78	R	R	2013-06-29	TRUE	FALSE
84	Mike	Pelfrey	240	79	R	R	2006-07-08	TRUE	FALSE
85	Dillon	Gee	205	73	R	R	2010-09-07	TRUE	FALSE
86	Matt	Harvey	220	76	R	R	2012-07-26	TRUE	TRUE
87	Carlos	Torres	180	73	R	R	2009-07-22	TRUE	FALSE
88	Jesse	Chavez	175	73	R	R	2008-08-27	TRUE	FALSE
89	Sonny	Gray	195	70	R	R	2013-07-10	TRUE	TRUE
90	Scott	Kazmir	185	72	L	L	2004-08-23	TRUE	TRUE
91	Justin	De Fratus	225	76	B	R	2011-09-18	TRUE	FALSE
92	Cole	Hamels	205	76	L	L	2006-05-12	TRUE	TRUE
93	A. J.	Burnett	230	76	R	R	1999-08-17	TRUE	TRUE
94	Jeff	Locke	200	72	L	L	2011-09-10	TRUE	TRUE
95	Charlie	Morton	215	77	R	R	2008-06-14	TRUE	TRUE
96	Vance	Worley	240	74	R	R	2010-07-24	TRUE	FALSE
97	Odrisamer	Despaigne	200	72	R	R	2014-06-23	FALSE	FALSE
98	J. A.	Happ	205	77	L	L	2007-06-30	TRUE	TRUE
99	Taijuan	Walker	235	76	R	R	2013-08-30	TRUE	FALSE
100	Tim	Lincecum	170	71	L	R	2007-05-06	TRUE	TRUE
101	Jaime	Garcia	215	74	L	L	2008-07-11	FALSE	FALSE
102	John	Lackey	235	78	R	R	2002-06-24	TRUE	TRUE
103	Nate	Karns	225	75	R	R	2013-05-28	TRUE	FALSE
104	Yovani	Gallardo	205	74	R	R	2007-06-18	FALSE	TRUE
105	Wandy	Rodriguez	195	71	B	L	2005-05-23	FALSE	FALSE
106	Mark	Buehrle	240	74	L	L	2000-07-16	TRUE	TRUE
107	Marco	Estrada	180	72	R	R	2008-08-20	FALSE	TRUE
108	Daniel	Norris	185	74	L	L	2014-09-05	TRUE	FALSE
109	Gio	Gonzalez	205	72	R	L	2008-08-06	TRUE	TRUE
110	Tanner	Roark	238	74	R	R	2013-08-07	TRUE	FALSE

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111   Stephen   Strasburg    235     77    R       R 2010-06-08    TRUE    TRUE
    age yearf
1    32  1985
2    25  1985
3    38  1985
4    26  1985
5    28  1985
6    33  1985
7    33  1985
8    31  1985
9    34  1985
10   29  1985
11   25  1985
12   29  1985
13   28  1985
14   28  1985
15   27  1985
16   29  1985
17   26  1985
18   36  1985
19   28  1985
20   30  1985
21   31  1985
22   29  1985
23   25  1985
24   28  1985
25   24  1985
26   43  1985
27   25  1985
28   25  1985
29   25  1985
30   28  1985
31   36  1985
32   25  1985
33   24  1985
34   27  1985
35   28  1985
36   28  1985
37   26  1985
38   26  1985
39   28  2015
40   26  2015
41   27  2015
42   24  2015
43   25  2015
44   24  2015
45   24  2015
46   24  2015
47   31  2015
48   27  2015
49   30  2015
50   26  2015
51   30  2015
52   26  2015
53   28  2015
54   29  2015
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55   25  2015
56   25  2015
57   28  2015
58   24  2015
59   28  2015
60   24  2015
61   34  2015
62   32  2015
63   27  2015
64   28  2015
65   36  2015
66   36  2015
67   28  2015
68   35  2015
69   27  2015
70   25  2015
71   25  2015
72   30  2015
73   25  2015
74   35  2015
75   28  2015
76   28  2015
77   29  2015
78   26  2015
79   30  2015
80   32  2015
81   26  2015
82   26  2015
83   28  2015
84   31  2015
85   29  2015
86   26  2015
87   33  2015
88   32  2015
89   26  2015
90   31  2015
91   28  2015
92   32  2015
93   38  2015
94   28  2015
95   32  2015
96   28  2015
97   28  2015
98   33  2015
99   23  2015
100  31  2015
101  29  2015
102  37  2015
103  28  2015
104  29  2015
105  36  2015
106  36  2015
107  32  2015
108  22  2015
109  30  2015
110  29  2015
```

```
111  27  2015
    yearID teamID lgID  playerID   salary stint POS  G GS InnOuts PO  A E DP
1     1985    ATL   NL bedrost01   550000     1   P 37 37     620 13 23 4  3
2     1985    ATL   NL  campri01   633333     1   P 66  2     383  7 13 4  3
3     1985    ATL   NL dedmoje01   150000     1   P 60  0     258  9 27 2  4
4     1985    ATL   NL garbege01   772000     1   P 59  0     292 11 17 0  1
5     1985    ATL   NL mahleri01   407500     1   P 39 39     800 21 45 4  9
6     1985    ATL   NL mcmurcr01   275000     1   P 17  6     135  2 12 2  0
7     1985    ATL   NL perezpa01   450000     1   P 22 22     286  7  9 1  0
8     1985    CAL   AL hollaal01   625000     2   P 38  0     176  2  5 0  1
9     1985    CHN   NL brusswa01   375000     1   P 51  0     223  6  3 2  0
10    1985    CHN   NL eckerde01   750000     1   P 25 25     508 10 26 3  1
11    1985    CHN   NL fontera01   200000     1   P 38 23     464  6 35 1  3
12    1985    CHN   NL ruthvdi01   766667     1   P 20 15     262  5 11 1  1
13    1985    CHN   NL sandesc01   500000     1   P 19 19     363 11 21 0  2
14    1985    CHN   NL sutclri01  1260000     1   P 20 20     390 12 23 1  0
15    1985    CHN   NL troutst01   640000     1   P 24 24     422  6 38 2  0
16    1985    CIN   NL brownto05    60000     1   P 38 38     784 12 34 2  1
17    1985    CIN   NL francjo01    75000     1   P 67  0     297  9 21 1  1
18    1985    CIN   NL mcgafan01   110000     1   P 15 15     283  8 12 1  2
19    1985    CIN   NL pastofr01   350000     1   P 17  6     162  3  9 1  1
20    1985    CIN   NL  sotoma01  1071429     1   P 36 36     770 13 34 2  0
21    1985    CIN   NL stupejo01   250000     1   P 33 13     297 12 14 0  0
22    1985    CIN   NL tibbsja01    60000     1   P 35 34     654 15 40 3  4
23    1985    DET   AL lapoida01   380000     1   P 31 31     620  8 23 1  1
24    1985    HOU   NL dawlebi01   295000     1   P 49  0     243  6 13 1  2
25    1985    HOU   NL dipinfr01   255000     1   P 54  0     228  3  5 1  0
26    1985    HOU   NL kneppbo01   850000     1   P 37 37     723  5 30 3  1
27    1985    HOU   NL niekrjo01   825000     1   P 32 32     639 14 34 1  1
28    1985    HOU   NL  ryanno01  1350000     1   P 35 35     696  6 20 2  0
29    1985    HOU   NL scottmi03   360000     1   P 36 35     665 21 22 2  1
30    1985    LAN   NL hershor01   212000     1   P 36 34     719 20 45 7  4
31    1985    LAN   NL honeyri01   705000     1   P 31 25     426  9 37 2  1
32    1985    LAN   NL niedeto01   370000     1   P 64  0     319  8  7 0  0
33    1985    LAN   NL reussje01   980000     1   P 34 33     638 12 27 3  0
34    1985    LAN   NL valenfe01  1200000     1   P 35 35     817 18 45 0  0
35    1985    LAN   NL welchbo01   643750     1   P 23 23     502 15 27 3  1
36    1985    MON   NL gullibi01   700000     1   P 29 29     544 10 26 1  0
37    1985    MON   NL palmeda01   375000     1   P 24 23     407 17 21 1  3
38    1985    MON   NL reardje01   850000     1   P 63  0     263  9  8 0  0
39    1985    MON   NL schatda01   375000     1   P 24 15     313  3 20 4  1
40    1985    MON   NL smithbr01   290000     1   P 32 32     667 24 27 5  2
41    1985    NYN   NL berenbr01   325000     1   P  3  3      41  1  4 0  1
42    1985    NYN   NL darliro01   230000     1   P 36 35     744 24 47 2  5
43    1985    NYN   NL goodedw01   450000     1   P 35 35     830 25 38 2  6
44    1985    NYN   NL lynched01   330000     1   P 31 29     573 15 14 2  2
45    1985    NYN   NL mcdowro01    60000     1   P 62  2     382 17 27 4  2
46    1985    NYN   NL oroscje01   650000     1   P 54  0     237  3  8 1  2
47    1985    PHI   NL carltst01  1075000     1   P 16 16     276  3 18 0  1
48    1985    PHI   NL dennyjo01  1109333     1   P 33 33     692 15 39 0  4
49    1985    PHI   NL grosske01   140000     1   P 38 31     617 18 34 3  0
50    1985    PHI   NL hudsoch02   192500     1   P 38 26     579 14 18 0  1
51    1985    PHI   NL koosmje01   600000     1   P 19 18     298  4 14 1  1
52    1985    PHI   NL rawlesh01   700000     1   P 36 31     596 12 36 1  2
53    1985    PHI   NL ruckeda01   220000     1   P 39  3     238  5 14 0  1
54    1985    PIT   NL deleojo01   155000     1   P 31 25     488  9 16 1  1
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55	1985	PIT	NL	guantce01	150000	1	P	63	0	327	6	13	1	0
56	1985	PIT	NL	mcwilla01	796667	1	P	30	19	379	4	21	0	0
57	1985	PIT	NL	reuscri01	200000	1	P	31	26	582	24	40	0	2
58	1985	PIT	NL	rhoderi01	645000	1	P	35	35	640	13	30	0	1
59	1985	PIT	NL	robindo01	520000	1	P	44	6	286	7	11	0	2
60	1985	PIT	NL	tunnele01	130000	1	P	24	23	397	7	23	0	1
61	1985	SDN	NL	draveda01	240000	1	P	34	31	644	13	30	3	2
62	1985	SDN	NL	hawkian01	200000	1	P	33	33	686	21	30	1	3
63	1985	SDN	NL	hoytla01	975000	1	P	31	31	631	12	40	1	4
64	1985	SDN	NL	leffecr01	270000	1	P	60	0	250	4	11	0	1
65	1985	SDN	NL	shower01	537500	1	P	35	35	699	14	24	4	2
66	1985	SDN	NL	thurmma01	130000	1	P	36	23	415	8	27	1	2
67	1985	SFN	NL	bluevi01	250000	1	P	33	20	393	7	21	2	1
68	1985	SFN	NL	davisma01	195000	1	P	77	1	343	2	12	0	0
69	1985	SFN	NL	garresc01	85000	1	P	74	0	317	7	22	2	0
70	1985	SFN	NL	gottji01	170000	1	P	26	26	445	9	28	0	0
71	1985	SFN	NL	hammaat01	355000	1	P	29	29	512	6	32	1	1
72	1985	SFN	NL	krukomi01	630000	1	P	28	28	584	6	27	1	3
73	1985	SFN	NL	laskebi01	355000	1	P	19	19	342	8	19	2	1
74	1985	SFN	NL	laskebi01	355000	2	P	11	7	103	4	7	0	0
75	1985	SLN	NL	andujjo01	1030000	1	P	38	38	809	8	45	6	8
76	1985	SLN	NL	campbbi02	457500	1	P	50	0	193	0	6	1	0
77	1985	SLN	NL	coxda01	110000	1	P	35	35	723	22	31	2	1
78	1985	SLN	NL	dayleke01	150000	1	P	57	0	196	5	15	0	0
79	1985	SLN	NL	forscbo01	583333	1	P	34	19	408	12	20	1	0
80	1985	SLN	NL	hortori01	110000	1	P	49	3	269	9	21	2	0
81	1985	SLN	NL	kepshku01	100000	1	P	32	29	460	5	19	1	1
82	1985	SLN	NL	tudorjo01	457500	1	P	36	36	825	18	45	3	4
83	2015	ARI	NL	anderch01	512500	1	P	27	27	458	8	14	2	2
84	2015	ARI	NL	collmjo01	1400000	1	P	44	12	363	17	14	0	0
85	2015	ARI	NL	corbipa01	524000	1	P	16	16	255	2	18	1	2
86	2015	ARI	NL	delarru01	516000	1	P	32	32	566	26	17	0	3
87	2015	ARI	NL	hellije01	4275000	1	P	27	27	438	11	19	2	0
88	2015	ATL	NL	cahiltr01	12000000	1	P	15	3	79	4	6	0	0
89	2015	ATL	NL	foltymi01	508750	1	P	18	15	260	2	5	1	1
90	2015	ATL	NL	gomesjo01	4000000	1	P	1	0	3	0	0	0	0
91	2015	ATL	NL	millesh01	535000	1	P	33	33	616	9	22	5	3
92	2015	ATL	NL	teherju01	1000000	1	P	33	33	602	16	30	1	5
93	2015	ATL	NL	woodal02	520000	1	P	20	20	358	2	14	2	2
94	2015	ATL	NL	woodal02	520000	2	P	12	12	211	2	13	0	1
95	2015	BAL	AL	jimenub01	12250000	1	P	32	32	552	7	15	1	1
96	2015	BOS	AL	kellyjo05	603000	1	P	25	25	403	20	23	4	1
97	2015	BOS	AL	masteju01	9500000	1	P	18	9	178	6	8	1	1
98	2015	CHA	AL	larocad01	12000000	1	P	1	0	3	0	0	0	0
99	2015	CHA	AL	ramiral03	10000000	1	P	1	0	3	0	0	0	0
100	2015	CHA	AL	salech01	6000000	1	P	31	31	626	7	16	1	1
101	2015	CHA	AL	samarje01	9800000	1	P	32	32	642	7	14	0	2
102	2015	CHN	NL	arrieja01	3630000	1	P	33	33	687	33	49	4	5
103	2015	CHN	NL	beeleda01	508000	1	P	3	3	25	1	2	0	0
104	2015	CHN	NL	denorch01	2600000	1	P	1	0	1	0	0	0	0
105	2015	CHN	NL	hammeja01	9000000	1	P	31	31	512	8	23	2	1
106	2015	CHN	NL	hendrky01	510000	1	P	32	32	540	17	29	0	2
107	2015	CHN	NL	lestejo01	20000000	1	P	32	32	615	10	17	3	1
108	2015	CHN	NL	rossda01	2500000	1	P	2	0	6	0	0	0	0
109	2015	CHN	NL	woodtr01	5686000	1	P	54	9	302	3	7	0	1
110	2015	CIN	NL	cuetojo01	10000000	1	P	19	19	392	12	18	0	1

111	2015	CIN	NL	desclan01	507500	1	P	31	31	554	14	21	2	0
112	2015	CIN	NL	iglesra01	1714286	1	P	18	16	286	12	14	2	1
113	2015	CIN	NL	leakemi01	9775000	1	P	21	21	410	17	24	1	1
114	2015	CIN	NL	leakemi01	9775000	2	P	9	9	166	2	8	0	1
115	2015	CIN	NL	marquja01	1500000	1	P	9	9	142	4	5	0	0
116	2015	CLE	AL	bauertr01	1940000	1	P	31	30	528	12	13	1	3
117	2015	CLE	AL	carraca01	2337500	1	P	30	30	551	8	14	0	1
118	2015	CLE	AL	murphda07	6000000	1	P	1	0	1	0	0	0	0
119	2015	CLE	AL	raburry01	2500000	1	P	1	0	2	0	0	0	0
120	2015	COL	NL	butleed01	509500	1	P	16	16	238	10	15	4	2
121	2015	COL	NL	kendrky01	5500000	1	P	27	27	427	10	18	2	2
122	2015	COL	NL	matzety01	509500	1	P	5	5	66	1	4	0	1
123	2015	COL	NL	delarjo01	12500000	1	P	26	26	447	5	22	0	0
124	2015	HOU	AL	feldmsc01	10000000	1	P	18	18	325	10	20	2	2
125	2015	HOU	AL	keuchda01	524500	1	P	33	33	696	18	53	1	1
126	2015	HOU	AL	mchugco01	516300	1	P	32	32	611	13	31	1	1
127	2015	KCA	AL	guthrje01	9000000	1	P	30	24	445	13	27	1	0
128	2015	KCA	AL	youngch03	675000	1	P	34	18	370	4	10	1	0
129	2015	LAA	AL	santihe01	2290000	1	P	33	32	542	4	20	0	3
130	2015	LAA	AL	wilsocj01	18000000	1	P	21	21	396	4	20	2	1
131	2015	LAN	NL	anderbr04	10000000	1	P	31	31	541	4	47	0	1
132	2015	LAN	NL	greinza01	25000000	1	P	32	32	668	19	41	2	2
133	2015	LAN	NL	kershcl01	32571000	1	P	33	33	698	8	45	1	1
134	2015	MIA	NL	alvarhe01	4000000	1	P	4	4	67	3	4	1	0
135	2015	MIA	NL	cosarja01	540000	1	P	14	13	209	1	19	0	0
136	2015	MIA	NL	dunnmi01	2350000	1	P	72	0	162	1	4	0	0
137	2015	MIA	NL	fernajo02	651000	1	P	11	11	194	3	1	0	0
138	2015	MIA	NL	handbr01	520000	1	P	38	12	280	2	18	0	1
139	2015	MIA	NL	harenda01	10000000	1	P	21	21	387	7	6	0	0
140	2015	MIA	NL	harenda01	10000000	2	P	11	11	175	2	3	0	0
141	2015	MIA	NL	koehlto01	555000	1	P	32	31	562	14	20	5	2
142	2015	MIA	NL	latosma01	9400000	1	P	16	16	265	8	10	0	1
143	2015	MIA	NL	latosma01	9400000	2	P	6	5	73	3	3	1	0
144	2015	MIA	NL	phelpda01	1400000	1	P	23	19	336	4	19	1	2
145	2015	MIA	NL	suzukic01	2000000	1	P	1	0	3	0	0	0	0
146	2015	MIL	NL	blazemi01	508500	1	P	45	0	167	5	9	1	0
147	2015	MIL	NL	fiersmi01	512500	1	P	21	21	354	5	11	4	0
148	2015	MIL	NL	garzama01	12500000	1	P	26	25	446	9	16	1	0
149	2015	MIL	NL	lohseky01	11000000	1	P	37	22	457	8	26	1	0
150	2015	MIL	NL	nelsoji02	511500	1	P	30	30	532	8	21	1	3
151	2015	MIL	NL	peralwi01	525500	1	P	20	20	326	11	18	2	1
152	2015	MIN	AL	gibsoky01	537500	1	P	32	32	584	16	27	1	3
153	2015	MIN	AL	pelfrmi01	5500000	1	P	30	30	494	8	20	0	2
154	2015	MIN	AL	robinsh01	550000	1	P	1	0	3	0	0	0	0
155	2015	NYA	AL	jonesga02	5000000	1	P	1	0	2	0	0	0	0
156	2015	NYA	AL	ryanbr01	2000000	1	P	1	0	6	0	0	0	0
157	2015	NYN	NL	colonba01	11000000	1	P	33	31	584	9	32	3	6
158	2015	NYN	NL	degroja01	556875	1	P	30	30	573	17	32	0	3
159	2015	NYN	NL	geedi01	5300000	1	P	8	7	119	5	10	1	2
160	2015	NYN	NL	harvema01	614125	1	P	29	29	568	6	19	2	1
161	2015	NYN	NL	niesejo01	7000000	1	P	33	29	530	7	39	1	4
162	2015	NYN	NL	torreca01	582125	1	P	59	0	173	5	17	0	1
163	2015	OAK	AL	chaveje01	2150000	1	P	30	26	471	10	10	2	0
164	2015	OAK	AL	davisik02	3800000	1	P	2	0	6	0	0	0	0
165	2015	OAK	AL	grayso01	512500	1	P	31	31	624	37	23	0	1
166	2015	OAK	AL	kazmisc01	13000000	1	P	18	18	329	1	12	2	0

167	2015	PHI	NL	billich01	1500000	1	P	7	7	111	2	6	1	1		
168	2015	PHI	NL	buchada01	512500	1	P	15	15	224	2	5	1	2		
169	2015	PHI	NL	defraju01	528000	1	P	61	0	240	10	3	2	1		
170	2015	PHI	NL	francje02	950000	1	P	1	0	6	1	0	0	0		
171	2015	PHI	NL	hamelco01	23500000	1	P	20	20	386	5	20	2	0		
172	2015	PHI	NL	hamelco01	23500000	2	P	12	12	251	5	5	0	1		
173	2015	PHI	NL	haranaa01	5000000	1	P	29	29	517	6	15	2	0		
174	2015	PIT	NL	burneaj01	8500000	1	P	26	26	492	11	20	3	1		
175	2015	PIT	NL	colege01	531000	1	P	32	32	624	10	37	0	1		
176	2015	PIT	NL	deckeja01	510000	1	P	1	0	3	0	1	0	0		
177	2015	PIT	NL	liriafr01	11666666	1	P	31	31	560	5	24	1	1		
178	2015	PIT	NL	lockeje01	531000	1	P	30	30	505	7	25	0	1		
179	2015	PIT	NL	mortoch02	8000000	1	P	23	23	387	9	16	2	1		
180	2015	PIT	NL	worleva01	2450000	1	P	23	8	215	1	14	0	2		
181	2015	SDN	NL	amarial01	1150000	1	P	1	0	1	0	0	0	0		
182	2015	SDN	NL	cashnan01	4050000	1	P	31	31	554	9	34	1	3		
183	2015	SDN	NL	despaod01	517300	1	P	34	18	377	5	30	0	0		
184	2015	SDN	NL	kenneia01	9850000	1	P	30	30	505	8	12	0	2		
185	2015	SDN	NL	rossty01	5250000	1	P	33	33	588	12	31	4	3		
186	2015	SDN	NL	shielja02	10000000	1	P	33	33	607	10	30	3	2		
187	2015	SEA	AL	happja01	6700000	2	P	11	11	190	2	9	0	0		
188	2015	SEA	AL	sucreje01	509300	1	P	2	0	6	0	0	0	0		
189	2015	SEA	AL	walketa01	513100	1	P	29	29	509	12	19	4	1		
190	2015	SFN	NL	bumgama01	6750000	1	P	32	32	655	5	19	1	1		
191	2015	SFN	NL	hudsoti01	12000000	1	P	24	22	371	7	15	0	4		
192	2015	SFN	NL	linceti01	18000000	1	P	15	15	229	3	7	0	0		
193	2015	SFN	NL	peavyja01	9000000	1	P	19	19	332	8	10	1	0		
194	2015	SFN	NL	vogelry01	4000000	1	P	33	22	405	7	13	0	1		
195	2015	SLN	NL	garcija02	9250000	1	P	20	20	389	2	30	2	1		
196	2015	SLN	NL	lackejo01	507500	1	P	33	33	654	20	15	2	3		
197	2015	SLN	NL	lynnla01	7000000	1	P	31	31	526	12	14	2	1		
198	2015	SLN	NL	martica04	520000	1	P	31	29	539	18	26	2	3		
199	2015	SLN	NL	wachami01	520000	1	P	30	30	544	18	29	3	0		
200	2015	TBA	AL	frankni01	1021800	1	P	1	0	3	0	0	0	0		
201	2015	TBA	AL	karnsna01	508800	1	P	27	26	441	5	13	1	0		
202	2015	TEX	AL	gallayo01	14000000	1	P	33	33	553	17	21	1	2		
203	2015	TEX	AL	rodriwa01	507000	1	P	17	15	259	3	7	1	0		
204	2015	TEX	AL	rosalad01	900000	1	P	2	0	6	0	0	0	0		
205	2015	TOR	AL	buehrma01	20000000	1	P	32	32	596	11	29	3	4		
206	2015	TOR	AL	estrama01	3900000	1	P	34	28	543	10	8	1	0		
207	2015	TOR	AL	norrida01	508700	2	P	8	8	110	3	3	0	1		
208	2015	WAS	NL	fistedo01	11400000	1	P	25	15	309	8	18	3	2		
209	2015	WAS	NL	gonzagi01	11000000	1	P	31	31	527	9	32	0	1		
210	2015	WAS	NL	moorety01	518200	1	P	1	0	2	0	0	0	0		
211	2015	WAS	NL	roarkta01	529600	1	P	40	12	333	9	15	0	3		
212	2015	WAS	NL	robincl01	525000	1	P	1	0	3	0	0	0	0		
213	2015	WAS	NL	scherma01	17142000	1	P	33	33	686	7	22	0	0		
214	2015	WAS	NL	strasst01	7400000	1	P	23	23	382	3	9	2	0		
215	2015	WAS	NL	zimmejo02	16500000	1	P	33	33	605	16	29	2	1		

	AB	R	H	X2B	X3B	HR	RBI	SB	CS	BB	SO	IBB	HBP	SH	SF	GIDP	batav
1	64	3	5	0	0	0	1	0	0	1	22	0	0	6	0	0	0.07812500
2	13	1	3	0	0	1	2	0	0	1	5	0	0	1	0	0	0.23076923
3	9	0	1	0	0	0	1	0	0	1	3	0	0	1	0	0	0.11111111
4	5	1	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0.20000000
5	90	9	14	1	0	0	8	0	0	3	18	0	0	11	1	2	0.15555556
6	14	0	1	0	0	0	0	0	0	0	7	0	0	1	0	1	0.07142857

7	25	0	3	0	0	0	1	0	0	3	13	0	0	4	0	0	0.12000000
8	5	1	2	0	1	0	0	0	0	1	2	0	0	1	0	0	0.40000000
9	7	0	1	0	0	0	0	0	0	1	5	0	0	0	0	0	0.14285714
10	56	1	7	0	0	1	1	0	0	7	25	0	0	2	0	0	0.12500000
11	41	2	2	0	0	0	0	0	0	0	18	0	0	4	0	1	0.04878049
12	24	1	5	0	0	0	1	0	1	0	7	0	0	6	0	1	0.20833333
13	31	1	2	0	0	0	1	0	0	1	17	0	1	6	0	0	0.06451613
14	43	4	10	0	0	1	3	0	0	2	10	0	0	2	1	1	0.23255814
15	46	2	5	1	0	0	2	0	0	2	13	0	0	9	0	0	0.10869565
16	88	4	17	2	1	0	2	0	0	4	29	0	0	9	0	2	0.19318182
17	6	1	2	0	0	0	1	0	0	0	0	0	0	2	0	0	0.33333333
18	29	0	1	1	0	0	1	0	0	1	18	0	0	1	0	0	0.03448276
19	14	1	2	1	0	0	0	0	0	0	6	0	0	2	0	0	0.14285714
20	83	3	11	0	1	0	4	0	0	1	24	0	0	6	0	1	0.13253012
21	17	0	1	0	0	0	1	1	1	3	10	0	0	7	0	0	0.05882353
22	65	3	6	0	0	0	3	0	0	2	33	0	0	6	0	1	0.09230769
23	60	4	10	1	0	0	6	0	0	6	11	0	0	5	0	0	0.16666667
24	10	1	2	0	0	0	0	0	0	1	3	0	0	0	0	0	0.20000000
25	12	1	2	0	0	0	1	0	0	0	7	0	0	0	0	0	0.16666667
26	78	5	11	1	0	1	5	0	0	2	38	0	0	8	0	0	0.14102564
27	68	6	17	1	0	0	6	0	0	1	16	0	0	10	1	4	0.25000000
28	63	2	7	2	0	0	4	0	1	4	21	0	0	14	1	1	0.11111111
29	72	7	11	3	0	1	11	1	0	4	24	0	0	3	2	2	0.15277778
30	76	5	15	1	0	0	4	1	0	4	20	0	1	10	0	0	0.19736842
31	38	5	5	1	0	0	1	0	0	3	6	0	0	8	0	1	0.13157895
32	9	0	1	0	0	0	0	0	0	0	3	0	0	1	0	0	0.11111111
33	74	1	10	0	0	0	7	0	0	2	28	0	0	6	1	1	0.13513514
34	97	7	21	2	0	1	7	0	1	0	9	0	0	5	1	3	0.21649485
35	50	4	9	1	0	0	4	0	0	3	13	0	0	7	0	1	0.18000000
36	64	2	12	4	0	0	6	0	0	0	17	0	0	4	0	1	0.18750000
37	36	1	4	1	0	0	0	0	0	0	10	0	0	5	0	2	0.11111111
38	7	0	2	0	0	0	1	0	0	0	4	0	0	2	0	0	0.28571429
39	31	4	6	1	0	2	5	0	0	1	10	0	0	1	0	1	0.19354839
40	72	6	14	1	0	1	4	0	0	3	24	0	0	11	0	1	0.19444444
41	4	1	1	1	0	0	1	0	0	0	2	0	0	2	0	0	0.25000000
42	76	9	13	4	0	0	0	1	0	4	25	0	0	13	0	0	0.17105263
43	93	11	21	2	0	1	9	0	0	5	15	0	0	9	0	1	0.22580645
44	52	1	4	0	0	0	0	0	0	3	30	0	0	9	0	1	0.07692308
45	19	1	3	1	0	0	1	0	0	1	7	0	0	2	0	0	0.15789474
46	7	0	3	0	0	0	0	0	0	0	1	0	0	2	0	0	0.42857143
47	28	2	5	1	0	0	3	0	0	1	8	0	0	1	1	1	0.17857143
48	81	2	10	1	0	0	4	2	0	4	19	0	0	3	0	0	0.12345679
49	65	1	9	2	0	1	6	0	0	2	23	0	0	8	0	1	0.13846154
50	57	2	8	0	0	0	3	0	0	1	18	0	1	3	0	1	0.14035088
51	34	1	3	0	0	0	4	0	0	1	9	0	0	1	1	2	0.08823529
52	58	3	8	1	0	0	6	0	0	5	21	0	0	7	2	0	0.13793103
53	12	2	4	1	0	0	0	0	0	1	5	0	0	1	0	0	0.33333333
54	36	1	2	0	0	0	0	0	0	3	19	0	0	7	0	0	0.05555556
55	17	0	1	0	0	0	0	0	0	0	12	0	0	0	0	0	0.05882353
56	40	2	5	1	0	0	2	0	0	1	19	0	0	4	0	1	0.12500000
57	59	8	10	2	0	1	7	1	0	3	17	0	0	6	0	0	0.16949153
58	74	2	14	3	0	0	6	0	0	2	7	0	0	2	0	2	0.18918919
59	21	2	5	2	0	1	4	0	0	0	11	0	1	0	0	0	0.23809524
60	47	2	4	0	1	0	1	0	1	1	20	0	0	0	1	0	0.08510638
61	69	5	8	1	1	0	1	0	0	4	20	0	0	6	0	0	0.11594203
62	77	1	6	0	0	0	3	0	0	3	16	0	0	13	0	1	0.07792208

63	64	4	4	0	0	0	2	0	0	1	21	0	0	12	0	1	0.06250000
64	4	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0.25000000
65	79	3	10	0	0	1	6	0	0	0	30	0	1	7	0	0	0.12658228
66	34	2	3	0	0	0	2	0	0	1	10	0	0	9	1	0	0.08823529
67	30	0	4	1	0	0	0	0	0	3	12	0	0	8	0	0	0.13333333
68	12	0	3	0	1	0	0	0	1	0	5	0	0	4	0	0	0.25000000
69	9	1	2	1	0	0	2	0	0	1	4	0	0	0	0	0	0.22222222
70	51	6	10	2	0	3	3	0	1	1	30	0	0	4	0	0	0.19607843
71	47	0	4	0	0	0	0	0	0	0	17	0	0	6	0	0	0.08510638
72	55	2	12	4	0	1	3	1	1	1	15	0	2	8	0	0	0.21818182
73	30	1	4	0	0	0	1	0	0	3	12	0	1	5	0	0	0.13333333
74	7	1	1	0	0	0	1	0	0	0	4	0	0	3	0	0	0.14285714
75	94	2	10	2	0	0	8	3	1	5	50	0	0	7	0	2	0.10638298
76	6	2	2	0	0	0	1	0	1	3	2	0	0	0	0	0	0.33333333
77	79	3	12	1	0	0	6	0	0	4	24	0	1	8	1	1	0.15189873
78	5	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0.40000000
79	45	3	11	2	1	1	4	0	0	0	10	0	0	2	0	0	0.24444444
80	16	1	1	0	0	0	0	0	0	3	5	0	0	2	0	0	0.06250000
81	51	6	6	3	0	0	2	0	0	1	18	0	0	7	1	0	0.11764706
82	94	9	13	3	2	0	2	0	1	5	25	0	0	7	0	1	0.13829787
83	48	0	5	0	0	0	3	0	0	1	23	0	0	8	0	2	0.10416667
84	27	2	5	0	0	0	1	0	0	3	9	0	0	2	0	1	0.18518519
85	25	1	3	0	0	0	3	0	0	3	11	0	0	1	0	1	0.12000000
86	64	3	6	0	0	0	2	0	0	0	25	0	0	4	0	0	0.09375000
87	41	3	9	0	0	0	7	0	0	2	14	0	2	3	1	0	0.21951220
88	5	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0.20000000
89	28	0	2	1	0	0	3	0	0	0	19	0	0	1	1	1	0.07142857
90	195	27	43	7	0	7	22	1	1	28	67	1	3	0	2	5	0.22051282
91	56	1	3	2	0	0	0	0	0	4	29	0	0	11	0	0	0.05357143
92	52	0	5	0	0	0	2	0	0	2	9	0	0	14	0	0	0.09615385
93	33	1	5	1	0	0	4	0	0	3	21	0	0	5	0	1	0.15151515
94	22	1	4	1	0	0	0	0	0	1	13	0	0	3	0	1	0.18181818
95	8	0	2	0	0	0	2	0	0	0	4	0	0	0	0	0	0.25000000
96	5	0	1	0	0	0	1	0	0	0	2	0	0	0	0	0	0.20000000
97	3	0	2	0	0	0	1	0	0	0	1	0	0	0	0	0	0.66666667
98	429	41	89	21	0	12	44	0	0	49	133	0	4	0	2	10	0.20745921
99	583	54	145	33	0	10	62	17	7	31	68	2	1	1	6	18	0.24871355
100	9	1	1	0	0	0	0	0	0	0	4	0	0	0	0	0	0.11111111
101	2	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0.50000000
102	79	5	12	1	1	2	2	0	0	1	45	0	0	3	0	1	0.15189873
103	3	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0.33333333
104	212	18	57	11	1	3	18	0	1	15	56	1	1	2	1	7	0.26886792
105	65	6	11	1	0	0	4	0	0	1	18	0	0	3	1	1	0.16923077
106	60	2	3	1	0	0	1	0	0	1	24	0	0	3	0	2	0.05000000
107	62	6	4	0	0	0	0	0	0	3	30	0	0	6	0	1	0.06451613
108	159	6	28	9	0	1	9	1	0	20	61	7	0	2	1	1	0.17610063
109	30	0	3	0	0	0	2	0	0	2	16	0	0	0	0	0	0.10000000
110	37	1	6	0	0	0	0	0	0	1	10	0	0	5	0	0	0.16216216
111	58	1	9	1	0	0	3	0	0	3	33	0	0	2	1	0	0.15517241
112	30	0	2	0	1	0	1	0	0	0	13	0	0	1	0	0	0.06666667
113	52	3	7	3	0	1	5	0	0	0	25	0	0	4	0	0	0.13461538
114	17	1	1	0	0	1	3	0	0	0	11	0	0	0	0	0	0.05882353
115	16	2	3	1	0	0	1	0	0	0	4	0	0	1	0	0	0.18750000
116	6	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0.16666667
117	1	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	1.00000000
118	206	22	61	12	1	5	27	0	1	16	29	1	1	1	4	4	0.29611650

119	173	22	52	16	1	8	29	0	0	23	44	3	4	0	1	5	0.30057803
120	23	0	1	0	0	0	0	0	0	0	13	0	0	1	0	0	0.04347826
121	43	6	8	2	0	1	2	0	0	3	16	0	0	3	0	1	0.18604651
122	8	3	3	1	0	0	0	0	0	0	1	0	0	1	0	0	0.37500000
123	48	0	3	0	0	0	3	0	0	0	18	0	0	2	0	1	0.06250000
124	2	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0.50000000
125	5	0	1	0	0	0	0	0	0	0	4	0	0	1	0	0	0.20000000
126	8	1	1	0	0	0	0	0	0	0	4	0	0	0	0	0	0.12500000
127	4	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0.25000000
128	4	0	2	0	0	0	3	0	0	0	1	0	0	0	0	0	0.50000000
129	5	0	1	0	0	0	0	0	0	0	3	0	0	0	0	1	0.20000000
130	6	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0.33333333
131	47	1	4	1	0	0	3	0	0	5	32	0	0	9	0	2	0.08510638
132	67	8	15	2	0	2	3	1	0	1	14	0	0	8	1	0	0.22388060
133	71	2	9	2	0	0	2	0	0	2	23	0	1	5	0	2	0.12676056
134	6	1	2	1	0	0	1	0	0	0	1	0	0	0	0	0	0.33333333
135	17	0	1	0	0	0	1	0	0	0	8	0	0	1	0	0	0.05882353
136	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00000000
137	18	2	3	1	0	1	2	0	0	0	4	0	0	4	0	0	0.16666667
138	17	1	2	0	0	0	2	0	0	0	5	0	0	6	0	0	0.11764706
139	32	3	5	1	0	0	4	0	0	2	12	0	0	8	0	1	0.15625000
140	17	1	1	0	0	0	1	0	0	3	4	0	0	2	1	1	0.05882353
141	50	2	6	1	0	0	1	0	0	2	28	0	0	12	0	1	0.12000000
142	18	0	5	0	0	0	1	0	0	0	6	0	0	9	0	0	0.27777778
143	6	1	2	0	0	0	0	0	0	0	1	0	0	1	0	0	0.33333333
144	34	0	4	0	0	0	0	0	0	0	16	0	1	5	0	0	0.11764706
145	398	45	91	5	6	1	21	11	5	31	51	1	0	5	4	8	0.22864322
146	4	0	1	1	0	0	1	0	0	0	2	0	0	0	0	0	0.25000000
147	30	0	3	0	0	0	0	0	0	0	12	0	0	4	0	0	0.10000000
148	39	0	3	0	0	0	0	0	1	1	21	0	0	7	0	0	0.07692308
149	39	3	9	1	0	0	1	0	0	0	10	0	0	3	0	1	0.23076923
150	55	1	6	1	0	0	2	0	0	1	34	0	0	3	0	0	0.10909091
151	30	1	1	0	0	0	1	0	0	3	15	0	0	4	0	0	0.03333333
152	5	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0.20000000
153	3	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0.66666667
154	180	28	45	7	3	0	16	6	1	12	29	0	1	3	1	4	0.25000000
155	144	12	31	4	1	5	17	0	0	8	37	0	0	0	0	1	0.21527778
156	96	10	22	6	2	0	8	0	0	5	29	0	1	1	0	1	0.22916667
157	58	2	8	1	0	0	4	0	0	0	24	0	1	4	1	2	0.13793103
158	59	3	11	1	0	0	4	0	0	3	16	0	0	4	0	4	0.18644068
159	10	0	1	0	0	0	0	0	0	0	5	0	0	2	0	0	0.10000000
160	65	1	7	2	0	1	7	0	0	0	31	0	0	1	0	2	0.10769231
161	52	5	9	1	0	0	4	0	0	5	18	0	0	3	0	0	0.17307692
162	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00000000
163	3	0	1	0	0	0	0	0	0	0	2	0	0	2	0	0	0.33333333
164	214	19	49	17	0	3	20	0	0	23	44	0	0	0	2	5	0.22897196
165	6	0	1	0	0	0	0	0	0	0	4	0	0	0	0	0	0.16666667
166	2	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0.50000000
167	13	2	1	0	0	1	1	0	0	0	5	0	0	1	0	1	0.07692308
168	20	2	4	1	0	0	1	0	0	2	8	0	0	1	0	0	0.20000000
169	3	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0.33333333
170	326	34	84	16	1	13	45	0	2	13	77	0	1	0	3	10	0.25766871
171	39	2	6	1	0	0	0	0	0	0	15	0	0	4	0	1	0.15384615
172	3	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0.33333333
173	48	4	8	1	0	0	0	0	0	1	18	0	0	9	0	2	0.16666667
174	42	1	5	0	0	1	5	0	0	0	20	0	0	9	1	1	0.11904762

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175  60  5   9   0   0  0   2  0  0  2  28   0   0  9  0    0 0.15000000
176  28  8   6   1   1  0   1  0  0  7   9   0   0  1  0    0 0.21428571
177  65  4  11   2   0  1   7  0  0  0  28   0   0  2  0    0 0.16923077
178  45  1   3   1   0  0   2  0  0  2  18   0   0  7  0    1 0.06666667
179  36  0   1   0   0  0   1  0  0  1  18   0   0  6  0    0 0.02777778
180  17  1   3   1   0  0   0  0  0  0   6   0   0  1  0    0 0.17647059
181 324 28  66  10   4  3  30  5  1 24  55   4   1  3  5    6 0.20370370
182  60  2   5   0   0  0   1  0  0  1  24   0   0  0  0    0 0.08333333
183  30  0   2   1   0  0   0  0  0  1  11   0   0  3  0    1 0.06666667
184  42  3   4   3   0  0   0  0  0  0  23   0   0  6  0    1 0.09523810
185  56  6  14   1   1  1   6  0  0  2  19   0   1  8  1    1 0.25000000
186  68  7   9   2   0  0   2  0  0  1  28   0   0  5  0    0 0.13235294
187  22  1   2   0   0  0   0  0  0  0  13   0   0  3  0    0 0.09090909
188 127  9  20   6   0  1   7  0  0  6  21   0   0  9  0    6 0.15748031
189   9  0   1   1   0  0   1  0  0  0   5   0   0  1  0    0 0.11111111
190  77  9  19   2   0  5   9  0  0  3  27   0   0  1  0    1 0.24675325
191  38  3   7   2   0  1   1  0  0  1  11   0   0  3  0    0 0.18421053
192  21  0   3   1   0  0   0  0  0  2  10   0   0  2  0    1 0.14285714
193  36  5   7   2   0  1   3  0  0  1  17   0   0  4  0    0 0.19444444
194  36  3   5   1   0  1   2  0  0  1  13   0   0  8  0    0 0.13888889
195  41  1   4   0   0  0   1  0  0  2  15   0   0  1  0    0 0.09756098
196  62  0   7   2   0  0   3  0  0  4  24   0   0  4  0    2 0.11290323
197  50  3   8   2   0  0   1  0  0  0  26   0   0  5  0    0 0.16000000
198  56  2   8   2   0  0   0  0  0  1  23   0   1  5  0    1 0.14285714
199  52  5   8   1   0  0   4  1  0  4  20   0   0  6  0    0 0.15384615
200 101 11  16   4   1  3   7  1  0  7  37   0   0  1  0    2 0.15841584
201   4  1   1   0   0  1   1  0  0  0   3   0   0  1  0    0 0.25000000
202   4  0   2   1   0  0   0  0  0  0   1   0   0  0  0    0 0.50000000
203   2  1   1   0   0  0   0  0  0  0   0   0   0  0  0    0 0.50000000
204 114 14  26   4   0  3   7  4  4 10  30   0   1  0  0    4 0.22807018
205   7  0   1   0   0  0   0  0  0  1   3   0   0  1  0    0 0.14285714
206   6  0   2   0   0  0   0  0  0  0   2   0   0  0  0    0 0.33333333
207   2  1   1   0   0  1   2  0  0  1   1   0   0  0  0    0 0.50000000
208  31  2   7   1   0  0   0  0  0  2  15   0   0  6  0    0 0.22580645
209  43  1   4   1   0  0   2  0  0  1  18   0   2 10  0    1 0.09302326
210 187 14  38  12   0  6  27  0  0 11  45   2   1  0  1    2 0.20320856
211  27  1   5   2   0  0   0  0  0  0   9   0   0  2  0    0 0.18518519
212 309 44  84  15   1 10  34  0  0 37  52   4   5  0  1    6 0.27184466
213  69  4  15   0   0  0   0  0  0  2  23   0   0  6  0    0 0.21739130
214  38  1   5   0   0  0   0  0  0  2  17   0   0  6  0    0 0.13157895
215  63  4  10   1   0  0   3  0  0  0  18   0   0  6  0    0 0.15873016
    birthYear nameFirst    nameLast weight height bats throws      debut
1        1957     Steve   Bedrosian    200     75    R      R 1981-08-14
2        1953      Rick        Camp    195     73    R      R 1976-09-15
3        1960      Jeff      Dedmon    200     74    L      R 1983-09-02
4        1947      Gene      Garber    175     70    R      R 1969-06-17
5        1953      Rick      Mahler    195     73    R      R 1979-04-20
6        1959     Craig    McMurtry    195     77    R      R 1983-04-10
7        1957   Pascual       Perez    162     74    R      R 1980-05-07
8        1952        Al     Holland    207     71    R      L 1977-09-05
9        1952    Warren    Brusstar    200     75    R      R 1977-05-06
10       1954    Dennis   Eckersley    190     74    R      R 1975-04-12
11       1957       Ray    Fontenot    175     72    L      L 1983-06-30
12       1951      Dick     Ruthven    190     75    R      R 1973-04-17
13       1956     Scott   Sanderson    195     77    R      R 1978-08-06
14       1956      Rick   Sutcliffe    215     79    L      R 1976-09-29
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15	1957	Steve	Trout	195	76	L	L	1978-07-01
16	1960	Tom	Browning	190	73	L	L	1984-09-09
17	1960	John	Franco	170	70	L	L	1984-04-24
18	1956	Andy	McGaffigan	185	75	R	R	1981-09-22
19	1957	Frank	Pastore	188	74	R	R	1979-04-04
20	1956	Mario	Soto	174	72	R	R	1977-07-21
21	1957	John	Stuper	200	74	R	R	1982-06-01
22	1962	Jay	Tibbs	185	75	R	R	1984-07-15
23	1959	Dave	LaPoint	205	75	L	L	1980-09-10
24	1958	Bill	Dawley	235	77	R	R	1983-04-15
25	1956	Frank	DiPino	175	70	L	L	1981-09-14
26	1954	Bob	Knepper	195	75	L	L	1976-09-10
27	1944	Joe	Niekro	185	73	R	R	1967-04-16
28	1947	Nolan	Ryan	170	74	R	R	1966-09-11
29	1955	Mike	Scott	210	74	R	R	1979-04-18
30	1958	Orel	Hershiser	190	75	R	R	1983-09-01
31	1954	Rick	Honeycutt	185	73	L	L	1977-08-24
32	1959	Tom	Niedenfuer	225	77	R	R	1981-08-15
33	1949	Jerry	Reuss	200	77	L	L	1969-09-27
34	1960	Fernando	Valenzuela	180	71	L	L	1980-09-15
35	1956	Bob	Welch	190	75	R	R	1978-06-20
36	1959	Bill	Gullickson	200	75	R	R	1979-09-26
37	1957	David	Palmer	195	73	R	R	1978-09-09
38	1955	Jeff	Reardon	190	72	R	R	1979-08-25
39	1954	Dan	Schatzeder	185	72	L	L	1977-09-04
40	1955	Bryn	Smith	200	74	R	R	1981-09-08
41	1954	Bruce	Berenyi	205	75	R	R	1980-07-05
42	1960	Ron	Darling	195	75	R	R	1983-09-06
43	1964	Dwight	Gooden	190	74	R	R	1984-04-07
44	1956	Ed	Lynch	230	78	R	R	1980-08-31
45	1960	Roger	McDowell	175	73	R	R	1985-04-11
46	1957	Jesse	Orosco	174	74	R	L	1979-04-05
47	1944	Steve	Carlton	210	76	L	L	1965-04-12
48	1952	John	Denny	185	75	R	R	1974-09-12
49	1961	Kevin	Gross	203	77	R	R	1983-06-25
50	1959	Charles	Hudson	185	75	B	R	1983-05-31
51	1942	Jerry	Koosman	205	74	R	L	1967-04-14
52	1955	Shane	Rawley	170	72	R	L	1978-04-06
53	1957	Dave	Rucker	185	73	L	L	1981-04-12
54	1960	Jose	DeLeon	210	75	R	R	1983-07-23
55	1960	Cecilio	Guante	200	75	R	R	1982-05-01
56	1954	Larry	McWilliams	180	77	L	L	1978-07-17
57	1949	Rick	Reuschel	215	75	R	R	1972-06-19
58	1953	Rick	Rhoden	195	75	R	R	1974-07-05
59	1957	Don	Robinson	225	76	R	R	1978-04-10
60	1960	Lee	Tunnell	180	73	R	R	1982-09-04
61	1956	Dave	Dravecky	195	73	R	L	1982-06-15
62	1960	Andy	Hawkins	200	76	R	R	1982-07-17
63	1955	LaMarr	Hoyt	195	75	R	R	1979-09-14
64	1957	Craig	Lefferts	180	73	L	L	1983-04-07
65	1956	Eric	Show	185	73	R	R	1981-09-02
66	1956	Mark	Thurmond	180	72	L	L	1983-05-14
67	1949	Vida	Blue	189	72	B	L	1969-07-20
68	1960	Mark	Davis	180	75	L	L	1980-09-12
69	1961	Scott	Garrelts	195	76	R	R	1982-10-02
70	1959	Jim	Gott	215	76	R	R	1982-04-09

71	1958	Atlee	Hammaker	200	75	B	L	1981-08-13
72	1952	Mike	Krukow	205	77	R	R	1976-09-06
73	1957	Bill	Laskey	190	77	R	R	1982-04-23
74	1957	Bill	Laskey	190	77	R	R	1982-04-23
75	1952	Joaquin	Andujar	170	72	B	R	1976-04-08
76	1948	Bill	Campbell	185	75	R	R	1973-07-14
77	1959	Danny	Cox	235	76	R	R	1983-08-06
78	1959	Ken	Dayley	171	72	L	L	1982-05-13
79	1950	Bob	Forsch	200	76	R	R	1974-07-07
80	1959	Ricky	Horton	195	74	L	L	1984-04-07
81	1959	Kurt	Kepshire	180	73	L	R	1984-07-04
82	1954	John	Tudor	185	72	L	L	1979-08-16
83	1987	Chase	Anderson	210	73	R	R	2014-05-11
84	1986	Josh	Collmenter	240	75	R	R	2011-04-17
85	1989	Patrick	Corbin	210	75	L	L	2012-04-30
86	1989	Rubby	De La Rosa	210	72	R	R	2011-05-24
87	1987	Jeremy	Hellickson	190	73	R	R	2010-08-02
88	1988	Trevor	Cahill	223	76	R	R	2009-04-07
89	1991	Mike	Foltynewicz	195	76	R	R	2014-08-02
90	1980	Jonny	Gomes	230	73	R	R	2003-09-12
91	1990	Shelby	Miller	225	75	R	R	2012-09-05
92	1991	Julio	Teheran	205	74	R	R	2011-05-07
93	1991	Alex	Wood	215	76	R	L	2013-05-30
94	1991	Alex	Wood	215	76	R	L	2013-05-30
95	1984	Ubaldo	Jimenez	221	77	R	R	2006-09-26
96	1988	Joe	Kelly	174	73	R	R	2012-06-10
97	1985	Justin	Masterson	260	78	R	R	2008-04-24
98	1979	Adam	LaRoche	205	74	L	L	2004-04-07
99	1981	Alexei	Ramirez	180	74	R	R	2008-03-31
100	1989	Chris	Sale	183	78	L	L	2010-08-06
101	1985	Jeff	Samardzija	233	76	R	R	2008-07-25
102	1986	Jake	Arrieta	230	76	R	R	2010-06-10
103	1989	Dallas	Beeler	225	77	R	R	2014-06-28
104	1980	Chris	Denorfia	195	72	R	R	2005-09-07
105	1982	Jason	Hammel	225	78	R	R	2006-04-11
106	1989	Kyle	Hendricks	190	75	R	R	2014-07-10
107	1984	Jon	Lester	240	76	L	L	2006-06-10
108	1977	David	Ross	230	74	R	R	2002-06-29
109	1987	Travis	Wood	175	71	R	L	2010-07-01
110	1986	Johnny	Cueto	229	71	R	R	2008-04-03
111	1990	Anthony	DeSclafani	195	74	R	R	2014-05-14
112	1990	Raisel	Iglesias	190	74	R	R	2015-04-12
113	1987	Mike	Leake	165	70	R	R	2010-04-11
114	1987	Mike	Leake	165	70	R	R	2010-04-11
115	1978	Jason	Marquis	220	73	L	R	2000-06-06
116	1991	Trevor	Bauer	205	73	R	R	2012-06-28
117	1987	Carlos	Carrasco	224	76	R	R	2009-09-01
118	1981	David	Murphy	210	75	L	L	2006-09-02
119	1981	Ryan	Raburn	185	72	R	R	2004-09-12
120	1991	Eddie	Butler	180	74	R	R	2014-06-06
121	1984	Kyle	Kendrick	220	75	R	R	2007-06-13
122	1990	Tyler	Matzek	230	75	L	L	2014-06-11
123	1981	Jorge	De La Rosa	215	73	L	L	2004-08-14
124	1983	Scott	Feldman	225	78	L	R	2005-08-31
125	1988	Dallas	Keuchel	220	74	L	L	2012-06-17
126	1987	Collin	McHugh	191	74	R	R	2012-08-23

127	1979	Jeremy	Guthrie	205	73	R	R	2004-08-28
128	1979	Chris	Young	255	82	R	R	2004-08-24
129	1987	Hector	Santiago	215	72	R	L	2011-07-06
130	1980	C. J.	Wilson	210	73	L	L	2005-06-10
131	1988	Brett	Anderson	230	76	L	L	2009-04-10
132	1983	Zack	Greinke	200	74	R	R	2004-05-22
133	1988	Clayton	Kershaw	225	76	L	L	2008-05-25
134	1990	Henderson	Alvarez	205	72	R	R	2011-08-10
135	1990	Jarred	Cosart	206	75	R	R	2013-07-12
136	1985	Mike	Dunn	212	72	L	L	2009-09-04
137	1992	Jose	Fernandez	240	75	R	R	2013-04-07
138	1990	Brad	Hand	215	75	L	L	2011-06-07
139	1980	Dan	Haren	215	77	R	R	2003-06-30
140	1980	Dan	Haren	215	77	R	R	2003-06-30
141	1986	Tom	Koehler	235	74	R	R	2012-09-05
142	1987	Mat	Latos	245	78	R	R	2009-07-19
143	1987	Mat	Latos	245	78	R	R	2009-07-19
144	1986	David	Phelps	198	74	R	R	2012-04-08
145	1973	Ichiro	Suzuki	175	71	L	R	2001-04-02
146	1989	Michael	Blazek	205	72	R	R	2013-06-22
147	1985	Mike	Fiers	211	74	R	R	2011-09-14
148	1983	Matt	Garza	220	76	R	R	2006-08-11
149	1978	Kyle	Lohse	215	74	R	R	2001-06-22
150	1989	Jimmy	Nelson	250	78	R	R	2013-09-06
151	1989	Wily	Peralta	255	73	R	R	2012-04-22
152	1987	Kyle	Gibson	215	78	R	R	2013-06-29
153	1984	Mike	Pelfrey	240	79	R	R	2006-07-08
154	1984	Shane	Robinson	170	69	R	R	2009-05-07
155	1981	Garrett	Jones	235	77	L	L	2007-05-15
156	1982	Brendan	Ryan	190	73	R	R	2007-06-02
157	1973	Bartolo	Colon	285	71	R	R	1997-04-04
158	1988	Jacob	deGrom	180	76	L	R	2014-05-15
159	1986	Dillon	Gee	205	73	R	R	2010-09-07
160	1989	Matt	Harvey	220	76	R	R	2012-07-26
161	1986	Jonathon	Niese	215	75	L	L	2008-09-02
162	1982	Carlos	Torres	180	73	R	R	2009-07-22
163	1983	Jesse	Chavez	175	73	R	R	2008-08-27
164	1987	Ike	Davis	220	76	L	L	2010-04-19
165	1989	Sonny	Gray	195	70	R	R	2013-07-10
166	1984	Scott	Kazmir	185	72	L	L	2004-08-23
167	1984	Chad	Billingsley	240	73	R	R	2006-06-15
168	1989	David	Buchanan	200	75	R	R	2014-05-24
169	1987	Justin	De Fratus	225	76	B	R	2011-09-18
170	1984	Jeff	Francoeur	225	76	R	R	2005-07-07
171	1983	Cole	Hamels	205	76	L	L	2006-05-12
172	1983	Cole	Hamels	205	76	L	L	2006-05-12
173	1978	Aaron	Harang	260	79	R	R	2002-05-25
174	1977	A. J.	Burnett	230	76	R	R	1999-08-17
175	1990	Gerrit	Cole	220	76	R	R	2013-06-11
176	1990	Jaff	Decker	190	69	L	L	2013-06-20
177	1983	Francisco	Liriano	220	75	L	L	2005-09-05
178	1987	Jeff	Locke	200	72	L	L	2011-09-10
179	1983	Charlie	Morton	215	77	R	R	2008-06-14
180	1987	Vance	Worley	240	74	R	R	2010-07-24
181	1989	Alexi	Amarista	160	66	L	R	2011-04-26
182	1986	Andrew	Cashner	235	78	R	R	2010-05-31

```
183      1987 Odrisamer   Despaigne    200     72    R      R 2014-06-23
184      1984       Ian     Kennedy    210     72    R      R 2007-09-01
185      1987     Tyson        Ross    254     77    R      R 2010-04-07
186      1981     James     Shields    210     75    R      R 2006-05-31
187      1982     J. A.        Happ    205     77    L      L 2007-06-30
188      1988     Jesus       Sucre    200     72    R      R 2013-05-24
189      1992   Taijuan      Walker    235     76    R      R 2013-08-30
190      1989   Madison   Bumgarner    255     76    R      L 2009-09-08
191      1975       Tim      Hudson    175     73    R      R 1999-06-08
192      1984       Tim    Lincecum    170     71    L      R 2007-05-06
193      1981      Jake       Peavy    195     73    R      R 2002-06-22
194      1977      Ryan   Vogelsong    215     76    R      R 2000-09-02
195      1986     Jaime      Garcia    215     74    L      L 2008-07-11
196      1978      John      Lackey    235     78    R      R 2002-06-24
197      1987     Lance        Lynn    250     77    B      R 2011-06-02
198      1991    Carlos    Martinez    200     72    R      R 2013-05-03
199      1991   Michael       Wacha    215     78    R      R 2013-05-30
200      1991      Nick    Franklin    190     73    B      R 2013-05-27
201      1987      Nate       Karns    225     75    R      R 2013-05-28
202      1986    Yovani    Gallardo    205     74    R      R 2007-06-18
203      1979     Wandy   Rodriguez    195     71    B      L 2005-05-23
204      1983      Adam     Rosales    200     74    R      R 2008-08-09
205      1979      Mark     Buehrle    240     74    L      L 2000-07-16
206      1983     Marco     Estrada    180     72    R      R 2008-08-20
207      1993    Daniel      Norris    185     74    L      L 2014-09-05
208      1984      Doug      Fister    210     80    L      R 2009-08-08
209      1985       Gio    Gonzalez    205     72    R      L 2008-08-06
210      1987     Tyler       Moore    220     74    R      R 2012-04-29
211      1986    Tanner       Roark    238     74    R      R 2013-08-07
212      1985     Clint    Robinson    240     77    L      L 2012-06-08
213      1984       Max    Scherzer    215     75    R      R 2008-04-29
214      1988   Stephen   Strasburg    235     77    R      R 2010-06-08
215      1986    Jordan  Zimmermann    225     74    R      R 2009-04-20
    bornUSA allstar age yearf
1      TRUE    TRUE  28  1985
2      TRUE   FALSE  32  1985
3      TRUE   FALSE  25  1985
4      TRUE   FALSE  38  1985
5      TRUE   FALSE  32  1985
6      TRUE   FALSE  26  1985
7     FALSE    TRUE  28  1985
8      TRUE    TRUE  33  1985
9      TRUE   FALSE  33  1985
10     TRUE    TRUE  31  1985
11     TRUE   FALSE  28  1985
12     TRUE    TRUE  34  1985
13     TRUE    TRUE  29  1985
14     TRUE    TRUE  29  1985
15     TRUE   FALSE  28  1985
16     TRUE    TRUE  25  1985
17     TRUE    TRUE  25  1985
18     TRUE   FALSE  29  1985
19     TRUE   FALSE  28  1985
20    FALSE    TRUE  29  1985
21     TRUE   FALSE  28  1985
22     TRUE   FALSE  23  1985
```

23	TRUE	FALSE	26	1985
24	TRUE	TRUE	27	1985
25	TRUE	FALSE	29	1985
26	TRUE	TRUE	31	1985
27	TRUE	TRUE	41	1985
28	TRUE	TRUE	38	1985
29	TRUE	TRUE	30	1985
30	TRUE	TRUE	27	1985
31	TRUE	TRUE	31	1985
32	TRUE	FALSE	26	1985
33	TRUE	TRUE	36	1985
34	FALSE	TRUE	25	1985
35	TRUE	TRUE	29	1985
36	TRUE	FALSE	26	1985
37	TRUE	FALSE	28	1985
38	TRUE	TRUE	30	1985
39	TRUE	FALSE	31	1985
40	TRUE	FALSE	30	1985
41	TRUE	FALSE	31	1985
42	TRUE	TRUE	25	1985
43	TRUE	TRUE	21	1985
44	TRUE	FALSE	29	1985
45	TRUE	FALSE	25	1985
46	TRUE	TRUE	28	1985
47	TRUE	TRUE	41	1985
48	TRUE	FALSE	33	1985
49	TRUE	TRUE	24	1985
50	TRUE	FALSE	26	1985
51	TRUE	TRUE	43	1985
52	TRUE	TRUE	30	1985
53	TRUE	FALSE	28	1985
54	FALSE	FALSE	25	1985
55	FALSE	FALSE	25	1985
56	TRUE	FALSE	31	1985
57	TRUE	TRUE	36	1985
58	TRUE	TRUE	32	1985
59	TRUE	FALSE	28	1985
60	TRUE	FALSE	25	1985
61	TRUE	TRUE	29	1985
62	TRUE	FALSE	25	1985
63	TRUE	TRUE	30	1985
64	FALSE	FALSE	28	1985
65	TRUE	FALSE	29	1985
66	TRUE	FALSE	29	1985
67	TRUE	TRUE	36	1985
68	TRUE	TRUE	25	1985
69	TRUE	TRUE	24	1985
70	TRUE	FALSE	26	1985
71	TRUE	TRUE	27	1985
72	TRUE	TRUE	33	1985
73	TRUE	FALSE	28	1985
74	TRUE	FALSE	28	1985
75	FALSE	TRUE	33	1985
76	TRUE	TRUE	37	1985
77	FALSE	FALSE	26	1985
78	TRUE	FALSE	26	1985

```
79     TRUE   FALSE  35  1985
80     TRUE   FALSE  26  1985
81     TRUE   FALSE  26  1985
82     TRUE   FALSE  31  1985
83     TRUE   FALSE  28  2015
84     TRUE   FALSE  29  2015
85     TRUE    TRUE  26  2015
86    FALSE   FALSE  26  2015
87     TRUE   FALSE  28  2015
88     TRUE    TRUE  27  2015
89     TRUE    TRUE  24  2015
90     TRUE   FALSE  35  2015
91     TRUE    TRUE  25  2015
92    FALSE    TRUE  24  2015
93     TRUE    TRUE  24  2015
94     TRUE    TRUE  24  2015
95    FALSE    TRUE  31  2015
96     TRUE   FALSE  27  2015
97    FALSE    TRUE  30  2015
98     TRUE   FALSE  36  2015
99    FALSE    TRUE  34  2015
100    TRUE    TRUE  26  2015
101    TRUE    TRUE  30  2015
102    TRUE    TRUE  29  2015
103    TRUE   FALSE  26  2015
104    TRUE   FALSE  35  2015
105    TRUE   FALSE  33  2015
106    TRUE   FALSE  26  2015
107    TRUE    TRUE  31  2015
108    TRUE   FALSE  38  2015
109    TRUE    TRUE  28  2015
110   FALSE    TRUE  29  2015
111    TRUE   FALSE  25  2015
112   FALSE   FALSE  25  2015
113    TRUE   FALSE  28  2015
114    TRUE   FALSE  28  2015
115    TRUE    TRUE  37  2015
116    TRUE    TRUE  24  2015
117   FALSE   FALSE  28  2015
118    TRUE   FALSE  34  2015
119    TRUE   FALSE  34  2015
120    TRUE   FALSE  24  2015
121    TRUE   FALSE  31  2015
122    TRUE   FALSE  25  2015
123   FALSE   FALSE  34  2015
124    TRUE   FALSE  32  2015
125    TRUE    TRUE  27  2015
126    TRUE   FALSE  28  2015
127    TRUE   FALSE  36  2015
128    TRUE    TRUE  36  2015
129    TRUE    TRUE  28  2015
130    TRUE    TRUE  35  2015
131    TRUE   FALSE  27  2015
132    TRUE    TRUE  32  2015
133    TRUE    TRUE  27  2015
134   FALSE    TRUE  25  2015
```

```
135    TRUE   FALSE  25  2015
136    TRUE   FALSE  30  2015
137   FALSE    TRUE  23  2015
138    TRUE    TRUE  25  2015
139    TRUE    TRUE  35  2015
140    TRUE    TRUE  35  2015
141    TRUE   FALSE  29  2015
142    TRUE   FALSE  28  2015
143    TRUE   FALSE  28  2015
144    TRUE   FALSE  29  2015
145   FALSE    TRUE  42  2015
146    TRUE   FALSE  26  2015
147    TRUE   FALSE  30  2015
148    TRUE   FALSE  32  2015
149    TRUE   FALSE  37  2015
150    TRUE   FALSE  26  2015
151   FALSE   FALSE  26  2015
152    TRUE   FALSE  28  2015
153    TRUE   FALSE  31  2015
154    TRUE   FALSE  31  2015
155    TRUE   FALSE  34  2015
156    TRUE   FALSE  33  2015
157   FALSE    TRUE  42  2015
158    TRUE    TRUE  27  2015
159    TRUE   FALSE  29  2015
160    TRUE    TRUE  26  2015
161    TRUE   FALSE  29  2015
162    TRUE   FALSE  33  2015
163    TRUE   FALSE  32  2015
164    TRUE   FALSE  28  2015
165    TRUE    TRUE  26  2015
166    TRUE    TRUE  31  2015
167    TRUE    TRUE  31  2015
168    TRUE   FALSE  26  2015
169    TRUE   FALSE  28  2015
170    TRUE   FALSE  31  2015
171    TRUE    TRUE  32  2015
172    TRUE    TRUE  32  2015
173    TRUE   FALSE  37  2015
174    TRUE    TRUE  38  2015
175    TRUE    TRUE  25  2015
176    TRUE   FALSE  25  2015
177   FALSE    TRUE  32  2015
178    TRUE    TRUE  28  2015
179    TRUE    TRUE  32  2015
180    TRUE   FALSE  28  2015
181   FALSE   FALSE  26  2015
182    TRUE   FALSE  29  2015
183   FALSE   FALSE  28  2015
184    TRUE   FALSE  31  2015
185    TRUE    TRUE  28  2015
186    TRUE    TRUE  34  2015
187    TRUE    TRUE  33  2015
188   FALSE   FALSE  27  2015
189    TRUE   FALSE  23  2015
190    TRUE    TRUE  26  2015
```

```
191    TRUE    TRUE  40  2015
192    TRUE    TRUE  31  2015
193    TRUE    TRUE  34  2015
194    TRUE    TRUE  38  2015
195   FALSE   FALSE  29  2015
196    TRUE    TRUE  37  2015
197    TRUE    TRUE  28  2015
198   FALSE    TRUE  24  2015
199    TRUE    TRUE  24  2015
200    TRUE   FALSE  24  2015
201    TRUE   FALSE  28  2015
202   FALSE    TRUE  29  2015
203   FALSE   FALSE  36  2015
204    TRUE   FALSE  32  2015
205    TRUE    TRUE  36  2015
206   FALSE    TRUE  32  2015
207    TRUE   FALSE  22  2015
208    TRUE   FALSE  31  2015
209    TRUE    TRUE  30  2015
210    TRUE   FALSE  28  2015
211    TRUE   FALSE  29  2015
212    TRUE   FALSE  30  2015
213    TRUE    TRUE  31  2015
214    TRUE    TRUE  27  2015
215    TRUE    TRUE  29  2015

Call:
glm.nb(formula = R ~ H + yearID + POS + height + age, data = OnBase[!OnBase$POS ==
    "P", ], init.theta = 12.16231864, link = log)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-3.9081  -0.8127  -0.0222   0.6093   2.5864

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  0.9491409  1.4031582   0.676   0.4988
H            0.0149010  0.0001916  77.758   <2e-16 ***
yearID       0.0007523  0.0006776   1.110   0.2668
POS2B       -0.0105352  0.0360169  -0.293   0.7699
POS3B        0.0077433  0.0338683   0.229   0.8192
POSC        -0.0648137  0.0409135  -1.584   0.1132
POSOF        0.0636785  0.0286484   2.223   0.0262 *
POSSS       -0.0127618  0.0382295  -0.334   0.7385
height      -0.0041732  0.0049296  -0.847   0.3972
age          0.0013349  0.0026134   0.511   0.6095
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for Negative Binomial(12.1623) family taken to be 1)

    Null deviance: 7759.5  on 1266  degrees of freedom
Residual deviance: 1521.0  on 1257  degrees of freedom
AIC: 9570.4

Number of Fisher Scoring iterations: 1
```

```
             Theta:  12.162
         Std. Err.:  0.768

 2 x log-likelihood:  -9548.363
```

Disscussion

After checking, we noticed that most of the 0 or 1 run have Position as Pitcher. This might be because of the designated hitter(DH), which is a player that bats in place of the pitcher. If pitchers are usually replaced by the designated hitters, then the number of a pitcher's Hits will be relatively lower. And it is quite impossible to make many Runs without having many Hits.

For the first model glm1 we got AIC 12616, which relates to how much information is lost summarising the original data by the model. And for the second model glm2 we got AIC 9570.4, which means 3,045.6 less of information was lost.

If we look at the plot, the red line is now much closer to the green line, but still not very flat.

e. [2 + 4 points] Now create a new model that includes teamID as a random effect. Ensure there are no fit warnings. What does the result tell us about the importance of team on number of runs that players score? Is this a relatively large or small effect? How could we check the statistical significance of this effect in R?

```
glm3 <- glmer(R ~ H + yearID + POS + height + age + (1|teamID), data = OnBase, family = "pois
son", nAGQ = 0)
glm3
```

```
Generalized linear mixed model fit by maximum likelihood (Adaptive
  Gauss-Hermite Quadrature, nAGQ = 0) [glmerMod]
 Family: poisson  ( log )
Formula: R ~ H + yearID + POS + height + age + (1 | teamID)
   Data: OnBase
      AIC       BIC    logLik  deviance  df.resid
12286.451 12350.065 -6131.225 12262.451      1470
Random effects:
 Groups Name        Std.Dev.
 teamID (Intercept) 0.0965
Number of obs: 1482, groups:  teamID, 33
Fixed Effects:
(Intercept)            H       yearID        POS2B        POS3B         POSC
   0.502201     0.012997     0.001066    -0.009808     0.009049    -0.062753
      POSOF         POSP        POSSS       height          age
   0.065600    -1.138439    -0.010986    -0.005710     0.004783
```

```
exp(2 * 0.0965)

# Check how many more times of runs depend on each team
exp(ranef(glm3)$teamID)

Anova(glm3)
```

```
[1] 1.212883
    (Intercept)
ARI   0.9433842
ATL   0.9066438
BAL   1.1699727
BOS   0.8734382
CAL   1.1711077
CHA   0.9839968
CHN   0.9502273
CIN   0.8853279
CLE   1.0282428
COL   1.0082428
DET   0.9924607
HOU   1.0972652
KCA   0.9153232
LAA   0.9244481
LAN   1.0601653
MIA   0.8437330
MIL   1.0524785
MIN   1.0677278
ML4   0.9957528
MON   0.9058651
NYA   1.1072143
NYN   1.0054558
OAK   1.1580862
PHI   1.0615564
PIT   0.9788635
SDN   1.0051807
SEA   0.8909177
SFN   0.9046561
SLN   1.0004142
TBA   0.9552639
TEX   0.9701180
TOR   1.1091583
WAS   1.2208075
Analysis of Deviance Table (Type II Wald chisquare tests)

Response: R
            Chisq Df Pr(>Chisq)
H      20010.2853  1  < 2.2e-16 ***
yearID    10.0154  1  0.0015523 **
POS     1092.8612  6  < 2.2e-16 ***
height     6.1329  1  0.0132693 *
age       14.4923  1  0.0001407 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
summary(glmer(R ~ H + yearID + POS + height + age + (1|teamID), data = OnBase, family = "pois
son", nAGQ = 0))

summary(glm(R ~ H + yearID + POS + height + age, data = OnBase, family = "poisson"))
```

```
Generalized linear mixed model fit by maximum likelihood (Adaptive
  Gauss-Hermite Quadrature, nAGQ = 0) [glmerMod]
 Family: poisson  ( log )
Formula: R ~ H + yearID + POS + height + age + (1 | teamID)
   Data: OnBase

     AIC      BIC   logLik deviance df.resid
 12286.5  12350.1  -6131.2  12262.5     1470

Scaled residuals:
    Min      1Q  Median      3Q     Max
-6.7776 -1.4380 -0.2174  0.9938 10.9249

Random effects:
 Groups Name        Variance Std.Dev.
 teamID (Intercept) 0.009313 0.0965
Number of obs: 1482, groups:  teamID, 33

Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  5.022e-01  6.956e-01   0.722 0.470321
H            1.300e-02  9.188e-05 141.458  < 2e-16 ***
yearID       1.066e-03  3.367e-04   3.165 0.001552 **
POS2B       -9.808e-03  1.698e-02  -0.578 0.563562
POS3B        9.049e-03  1.584e-02   0.571 0.567888
POSC        -6.275e-02  2.085e-02  -3.009 0.002617 **
POSOF        6.560e-02  1.330e-02   4.933 8.09e-07 ***
POSP        -1.138e+00  3.730e-02 -30.523  < 2e-16 ***
POSSS       -1.099e-02  1.767e-02  -0.622 0.534108
height      -5.710e-03  2.306e-03  -2.476 0.013269 *
age          4.783e-03  1.256e-03   3.807 0.000141 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
       (Intr) H      yearID POS2B  POS3B  POSC   POSOF  POSP   POSSS  height
H      -0.156
yearID -0.968  0.153
POS2B  -0.053 -0.002 -0.029
POS3B  -0.054  0.024  0.004  0.462
POSC   -0.057  0.115  0.025  0.340  0.352
POSOF  -0.062  0.026  0.022  0.531  0.544  0.410
POSP   -0.016  0.247  0.021  0.171  0.188  0.167  0.228
POSSS  -0.052  0.005 -0.012  0.444  0.433  0.320  0.503  0.164
height -0.208 -0.082 -0.036  0.265  0.146  0.088  0.095 -0.066  0.193
age    -0.147  0.226  0.093  0.124  0.065  0.044  0.096  0.068  0.153 -0.005

Call:
glm(formula = R ~ H + yearID + POS + height + age, family = "poisson",
    data = OnBase)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-9.1745  -1.5840  -0.2634   1.0653   7.9508
```

```
Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)  1.018e+00  6.379e-01   1.596  0.11048
H            1.285e-02  8.953e-05 143.571  < 2e-16 ***
yearID       7.435e-04  3.095e-04   2.402  0.01629 *
POS2B       -1.152e-02  1.671e-02  -0.689  0.49063
POS3B        5.319e-03  1.574e-02   0.338  0.73535
POSC        -6.297e-02  2.074e-02  -3.036  0.00239 **
POSOF        6.322e-02  1.319e-02   4.792 1.65e-06 ***
POSP        -1.171e+00  3.710e-02 -31.556  < 2e-16 ***
POSSS       -1.123e-02  1.754e-02  -0.640  0.52207
height      -3.584e-03  2.241e-03  -1.599  0.10982
age          4.693e-03  1.202e-03   3.904 9.47e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for poisson family taken to be 1)

    Null deviance: 38805.9  on 1481  degrees of freedom
Residual deviance:  5695.8  on 1471  degrees of freedom
AIC: 12616

Number of Fisher Scoring iterations: 5
```

Disscussion

The standard deviation for teamID is 0.0965, and the exp(2 * 0.0965) is 1.212883, which means we will expect the better teams to score 1.2 times more of runs than the average teams, and 1.2 times less of runs for the bottom teams.

f. [2 + 0 points] What is the mean number of runs could you expect 30-year old, 72 inch tall outfielders playing for the Baltimore Orioles in 2015 with 20 hits to have scored?

```
predict(glm3, newdata = data.frame(age = 30, height = 72, POS = "OF", teamID = "BAL", yearID
 = 2015, H = 20), type = "response")
```

```
      1
17.5339
```

4. Lasso Regression for Logistic Regression

a. [4 + 0 points] Create a new dataset DivWinners by removing all of the variables that are team or park identifiers in the dataset, as well as ‘lgID’, ‘Rank’,‘franchID’,‘divID’, ‘WCWin’,‘LgWin’, and ‘WSwin’. Split the resulting into a training and a testing set so that the variable ‘DivWin’ is balanced between the two datasets. Use the seed 123.

```
DivWinners <- Teamdata %>%
  select(-lgID, -teamID, -franchID, -divID, -Rank, -WCWin, -LgWin, -WSWin, -name, -park, -tea
mIDBR, -teamIDlahman45, -teamIDretro, -log10_meansalary)

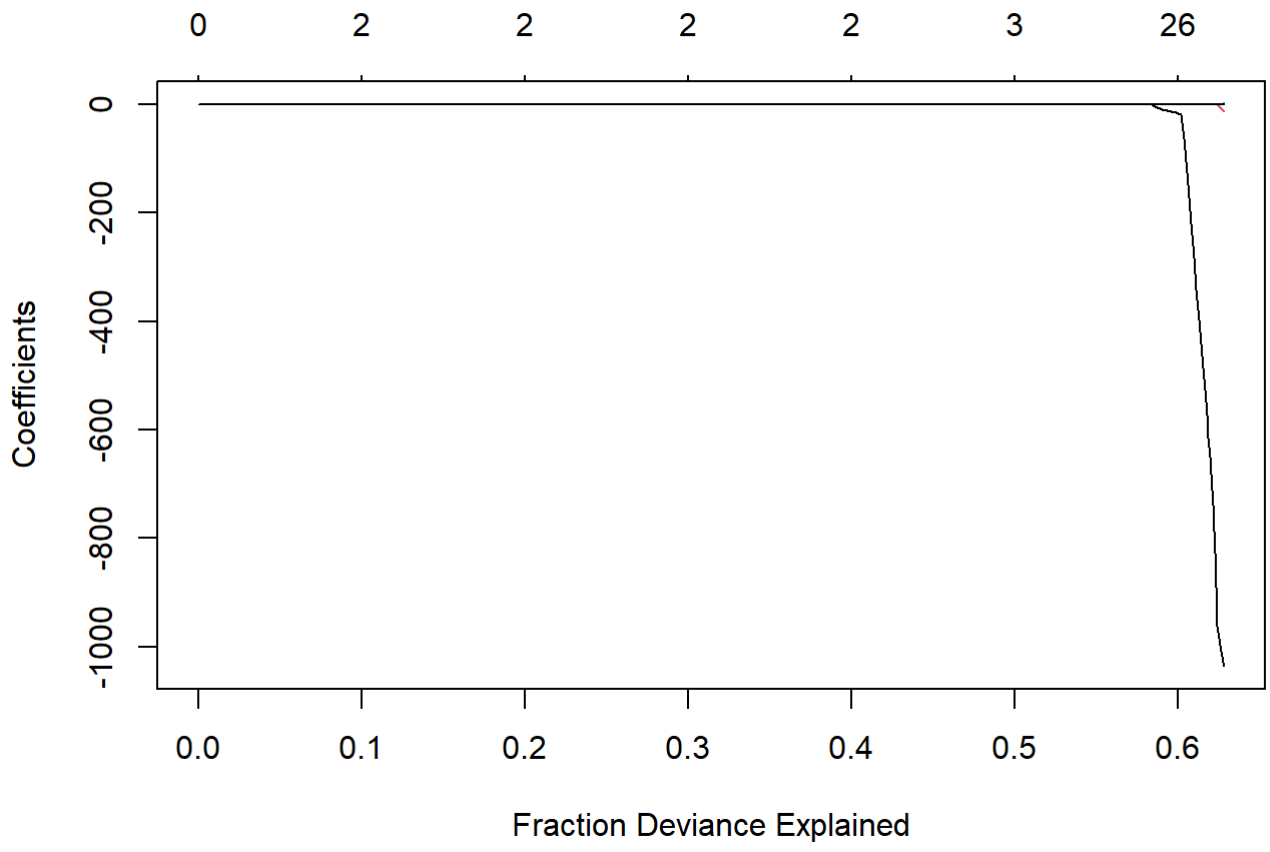
set.seed(123)
training.samples <- DivWinners$DivWin %>%
createDataPartition(p = 0.8, list = FALSE)
train.data <- DivWinners[training.samples, ]
test.data <- DivWinners[-training.samples, ]
```

b. [4 + 0 points] Use the training data to fit a logistic regression model using the 'glmnet' command. Plot residual deviance against number of predictors.

```
divwin <- as.vector(DivWinners$DivWin)
divwin_predictor <- model.matrix(~. -1, DivWinners[,-c(6)])
# Remove column corresponding to the response and use the model.matrix function to expand all
of the factors into dummy variables.

divwin_fit <- glmnet(divwin_predictor, divwin, family = "binomial")  # Fitting the model with
lasso function

plot(divwin_fit, xvar = "dev")  # Plot the fraction of deviance that is explained in the mode
l as the number of coefficients increases
```



c. [2 + 2 points] How many nonzero model coefficients are needed to explain 50% of the deviance? 60%? Which coefficients are these in each case?

```
divwin_fit   # To check the lambda we need for 50% and 60% of deviance
```

```
Call:  glmnet(x = divwin_predictor, y = divwin, family = "binomial")

    Df  %Dev   Lambda
1    0  0.00 0.244800
2    1  6.32 0.223000
3    2 11.75 0.203200
4    2 16.49 0.185100
5    2 20.62 0.168700
6    2 24.26 0.153700
7    2 27.47 0.140100
8    2 30.34 0.127600
9    2 32.90 0.116300
10   2 35.20 0.105900
11   2 37.27 0.096540
12   2 39.13 0.087960
13   2 40.82 0.080150
14   2 42.34 0.073030
15   2 43.72 0.066540
16   2 44.96 0.060630
17   2 46.08 0.055240
18   2 47.09 0.050330
19   2 48.00 0.045860
20   2 48.81 0.041790
21   3 49.57 0.038080
22   3 50.30 0.034690
23   3 50.95 0.031610
24   3 51.52 0.028800
25   3 52.04 0.026240
26   3 52.49 0.023910
27   3 52.89 0.021790
28   3 53.24 0.019850
29   3 53.56 0.018090
30   3 53.83 0.016480
31   4 54.12 0.015020
32   5 54.38 0.013680
33   5 54.63 0.012470
34   7 54.87 0.011360
35   8 55.26 0.010350
36   9 55.63 0.009432
37  10 55.98 0.008594
38  10 56.30 0.007830
39  12 56.59 0.007135
40  12 56.87 0.006501
41  13 57.12 0.005923
42  15 57.39 0.005397
43  16 57.67 0.004918
44  16 57.95 0.004481
45  16 58.20 0.004083
46  17 58.41 0.003720
47  17 58.60 0.003390
48  18 58.76 0.003088
49  20 58.91 0.002814
50  20 59.06 0.002564
51  21 59.19 0.002336
```

```
52  22 59.34 0.002129
53  22 59.48 0.001940
54  23 59.61 0.001767
55  23 59.72 0.001610
56  25 59.87 0.001467
57  26 60.03 0.001337
58  27 60.20 0.001218
59  28 60.41 0.001110
60  27 60.63 0.001011
61  29 60.82 0.000922
62  29 60.97 0.000840
63  30 61.13 0.000765
64  31 61.29 0.000697
65  31 61.42 0.000635
66  31 61.55 0.000579
67  33 61.65 0.000527
68  33 61.77 0.000481
69  33 61.88 0.000438
70  33 61.97 0.000399
71  33 62.04 0.000364
72  33 62.11 0.000331
73  33 62.16 0.000302
74  33 62.20 0.000275
75  33 62.24 0.000251
76  33 62.27 0.000228
77  33 62.30 0.000208
78  33 62.32 0.000189
79  33 62.34 0.000173
80  33 62.35 0.000157
81  33 62.37 0.000143
82  33 62.38 0.000131
83  33 62.39 0.000119
84  34 62.40 0.000108
85  34 62.40 0.000099
86  35 62.41 0.000090
87  36 62.43 0.000082
88  37 62.47 0.000075
89  37 62.51 0.000068
90  37 62.55 0.000062
91  37 62.58 0.000057
92  37 62.62 0.000052
93  37 62.65 0.000047
94  37 62.68 0.000043
95  37 62.71 0.000039
96  37 62.74 0.000036
97  37 62.77 0.000032
98  37 62.80 0.000029
99  37 62.82 0.000027
100 37 62.83 0.000024
```

```
# 50%
divwin_fit3 <- coef(divwin_fit, s = 0.034690)
divwin_fit3@Dimnames[[1]][1 + divwin_fit3@i]
```

```
[1] "(Intercept)" "W"           "L"           "attendance"
```

Disscussion

To explain 50% of the deviance, we will need 3 nonzero model coefficients, which are “W”, “L”, and “attendance”.

```
# 60%
divwin_fit26 <- coef(divwin_fit, s = 0.001337)
divwin_fit26@Dimnames[[1]][1 + divwin_fit26@i]
```

```
 [1] "(Intercept)" "yearID"      "Ghome"       "W"           "L"
 [6] "R"           "AB"          "H"           "X2B"         "HR"
[11] "BB"          "SB"          "CS"          "HBP"         "SF"
[16] "CG"          "SHO"         "IPouts"      "HA"          "BBA"
[21] "SOA"         "DP"          "FP"          "attendance"  "PPF"
[26] "meansalary"  "rostersize"
```

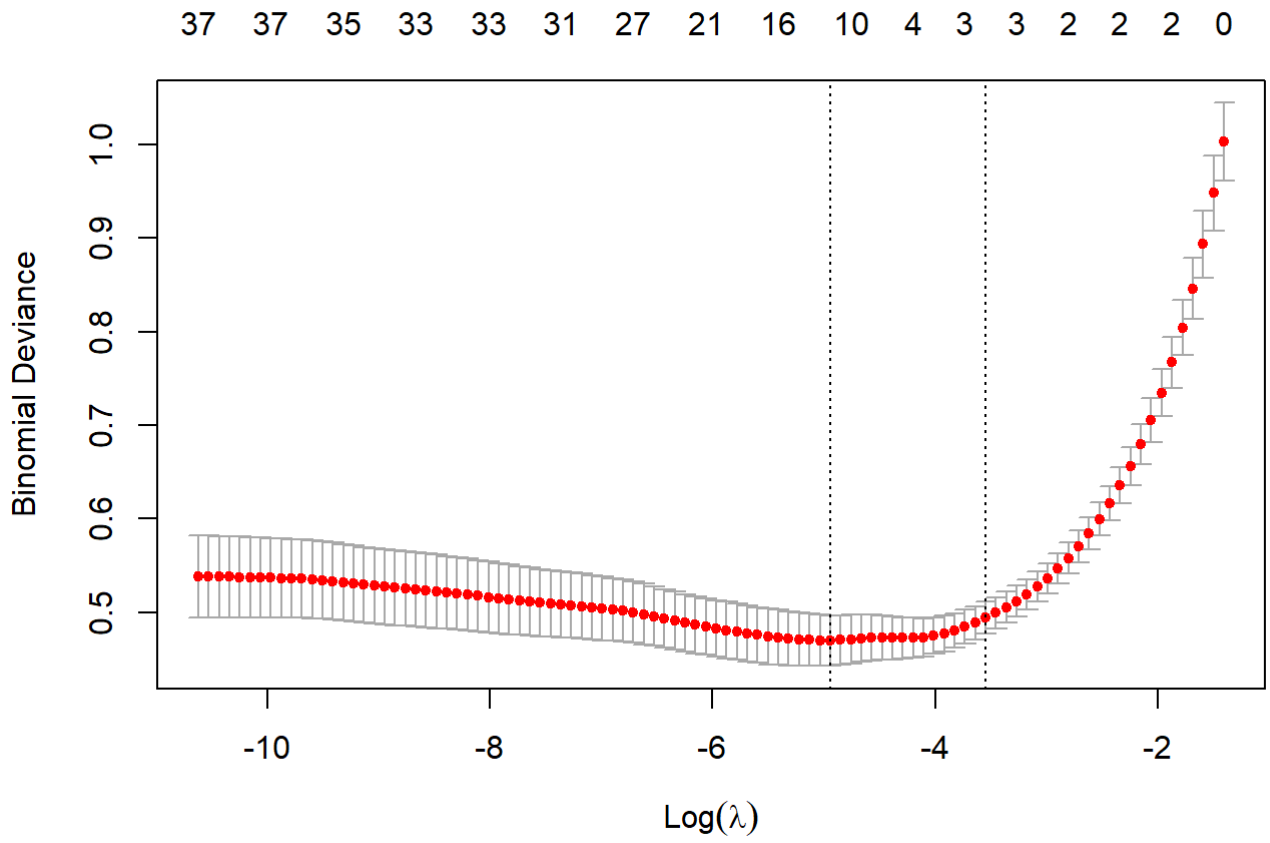
Disscussion

To explain 60% of the deviance, we will need 26 nonzero model coefficients, which are “yearID”, “Ghome”, “W”, “L”, “R”, “AB”, “H”, “X2B”, “HR”, “BB”, “SB”, “CS”, “HBP”, “SF”, “CG”, “SHO”, “IPouts”, “HA”, “BBA”, “SOA”,“DP”, “FP”, “attendance”, “PPF”, “meansalary”, and “rostersize”.

d. [2 + 1 points] Now use cross-validation to choose a moderately conservative model. State the variables you will include.

```
set.seed(123)
divwin_fitcv <- cv.glmnet(divwin_predictor, divwin, family = "binomial")
divwin_fitcv

plot(divwin_fitcv)
```




```
Call:  cv.glmnet(x = divwin_predictor, y = divwin, family = "binomial")

Measure: Binomial Deviance

      Lambda Index Measure      SE Nonzero
min 0.007135    39  0.4697 0.02681      12
1se 0.028803    24  0.4938 0.01722       3
```

Disscussion

As we can see from the plot as log(lambda) decreases, the binomial deviance gets smaller until around log(lambda)=-5. Given the binomial deviance bars, we could chose a log(lambda) anywhere between the lambda 1se and lambda min and get similar performance. And we knew that 60% of the variance was explained with 26 coefficients, I would suggest we look for a smaller model, and use the variables selected up to the minimum as a way of deciding if we include factors or not. With lambda minimum, there will be 12 nonzero model coefficients including “W”, “L”, “X2B”, “BB”, “SB”, “HBP”, “CG”, “HA”, “BBA”, “DP”, “attendance”, and “rostersize” that we will include.

```
divwin_fitmax <- coef(divwin_fit, s = divwin_fitcv$lambda.min)
divwin_fitmax@Dimnames[[1]][1 + divwin_fitmax@i]
```

```
 [1] "(Intercept)" "W"           "L"           "X2B"         "BB"
 [6] "SB"          "HBP"         "CG"          "HA"          "BBA"
[11] "DP"          "attendance"  "rostersize"
```

e. [4 + 2 points] Fit the model on the training data, then predict on the testing data. Plot comparative ROC curves and summarise your findings.

```
set.seed(123)

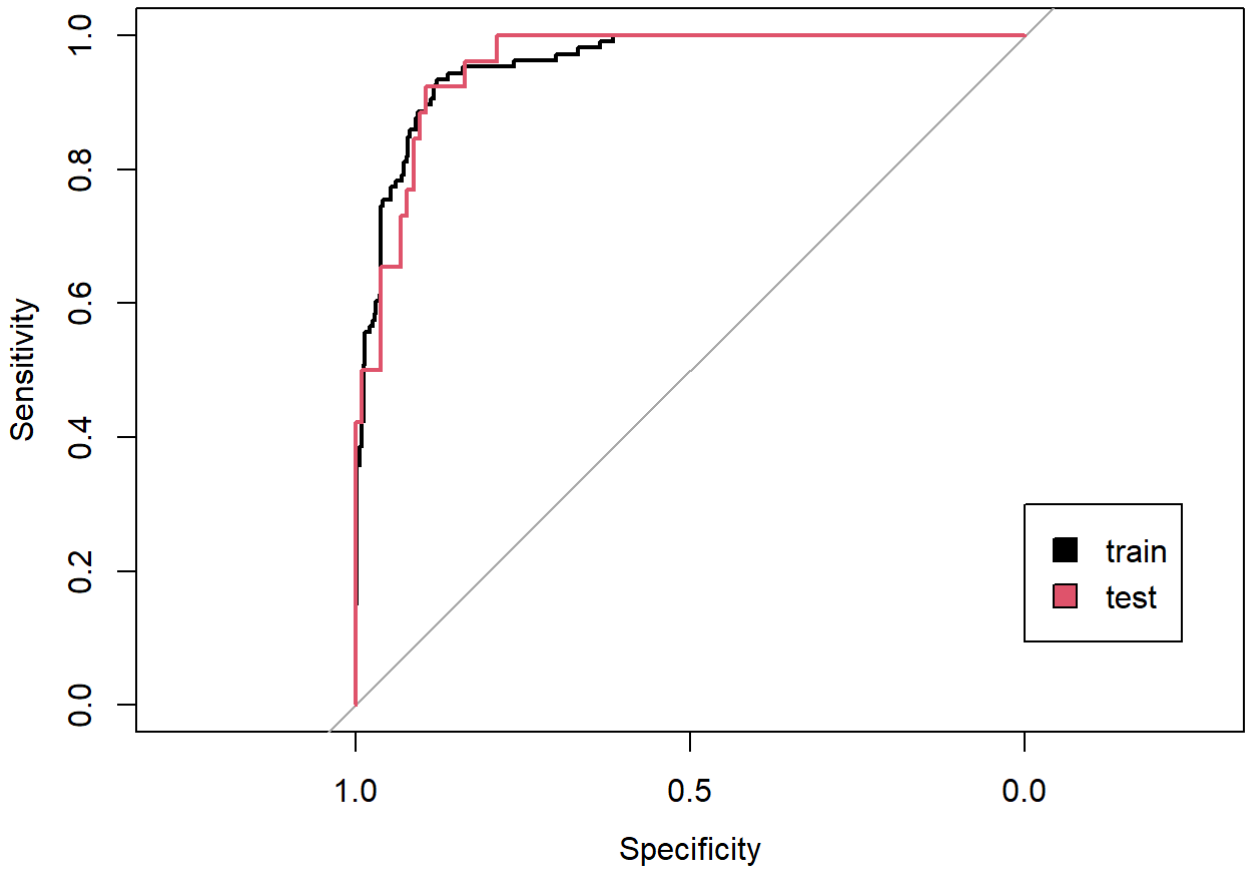
training.samples <- DivWinners$DivWin %>%
  createDataPartition(p = 0.8, list = FALSE)
train.data <- DivWinners[training.samples, ]    # Set training data
test.data <- DivWinners[-training.samples, ]    # Set testing data

train_model <- glm(as.factor(DivWin) ~ W + L + X2B + BB + SB + HBP + CG + HA + BBA + DP + att
endance + rostersize, data = train.data, family = "binomial")    # Fit model on training data
```

```
# Predict model on training data
pred_divwin_train <- predict(train_model, type = "response")

# Predict model on testing data
pred_divwin_test <- predict(train_model, newdata = test.data, type = "response")

# Plot comparative ROC curve
roc_divwin_train <- roc(response = train.data$DivWin, predictor = pred_divwin_train, plot = T
RUE, auc = TRUE)
roc_divwin_test <- roc(response = test.data$DivWin, predictor = pred_divwin_test, plot = TRUE
, auc = TRUE, add = TRUE, col = 2)
legend(0, 0.3, legend = c("train", "test"), fill = 1:2)
```




```
ggtitle("ROC curve of prediction on train and test data")
```

```
$title
[1] "ROC curve of prediction on train and test data"

attr(,"class")
[1] "labels"
```

Disscussion

The plot tells us the sensitivity and specificity that we can achieve with cutoff values. We can see that if we set specificity less than 75%, the sensitivity will always be 100%, that means the prediction will always be No for Division Winner. And if we set sensitivity less than 37.5%, the specificity will be 100%, which means the prediction will always be Yes for Division Winner. So we should avoid setting the cutoff value at these points.

f. [4 + 2 points] Find Youden's index for the training data and calculate confusion matrices at this cutoff for both training and testing data. Comment on the quality of the model for prediction in terms of false negative and false positive rates for the testing data.

```
# Youden's index
youden_divwin <- coords(roc_divwin_train, "b", best.method = "youden", transpose = TRUE)
youden_divwin
youden_divwin[2] + youden_divwin[3]
```

```
  threshold specificity sensitivity
  0.2100611   0.8779904   0.9339623
specificity
   1.811953
```

```
# Confusion matrix for train data
train.data$preddivwin <- ifelse(predict(train_model, newdata = train.data, type = "response")
>= 0.3, "Y", "N")
table(train.data$preddivwin, as.factor(train.data$DivWin))
```

```
     N   Y
  N 380  13
  Y  38  93
```

```
# Confusion matrix for test data
test.data$preddivwin <- ifelse(predict(train_model, newdata = test.data, type = "response")>=
0.3, "Y", "N")
table(test.data$preddivwin, as.factor(test.data$DivWin))
```

```
    N  Y
  N 92  2
  Y 12 24
```

Disscussion

false negative 2/26 = 0.08 false positive 12/104 = 0.12 false prediction = 0.2

As we can see, the quality of the model for prediction on test data is pretty good. When we set the threshold at 0.2, we achieved a sensitivity + specificity of 1.8, which means it's 80% better than no model. If we look at the false negative and false positive results, we also have 20% chance to predict wrong.

g. [5 + 1 points] Calculate the sensitivity+specificity on the testing data as a function of divID and plot as a barchart. Is the prediction equally good for all divisions?

```
div_id <- Teamdata %>%
  select(divID, meansalary)             # Look back for the variable "divID"

DivWinners <- DivWinners%>%
  left_join(div_id) %>%
  mutate_at(vars(divID), list(factor))  # Join the "divID" variable back to the dataset

set.seed(123)
training.samples2 <- DivWinners$DivWin %>%
createDataPartition(p = 0.8, list = FALSE)
train.data2 <- DivWinners[training.samples2, ]
test.data2 <- DivWinners[-training.samples2, ]  # Separate into train and test data

test.data2 <- test.data2 %>%
  left_join(test.data)           # Join the data to include "preddivwin"

test_div_E <- test.data2 %>%
  filter(divID == "E")           # Filter out division E
div_E_tab <- table(test_div_E$preddivwin, as.factor(test_div_E$DivWin))  # Create confusion m
atrix for calculation later
sens_spe_E <- data_frame(sensitivity(div_E_tab) + specificity(div_E_tab)) %>%
  clean_names() %>%
  rename(sens_spec = sensitivity_div_e_tab_specificity_div_e_tab) %>%
  mutate(divID = "Div_E")       # Create a new data frame include division ID and sensitivity
+ specificity

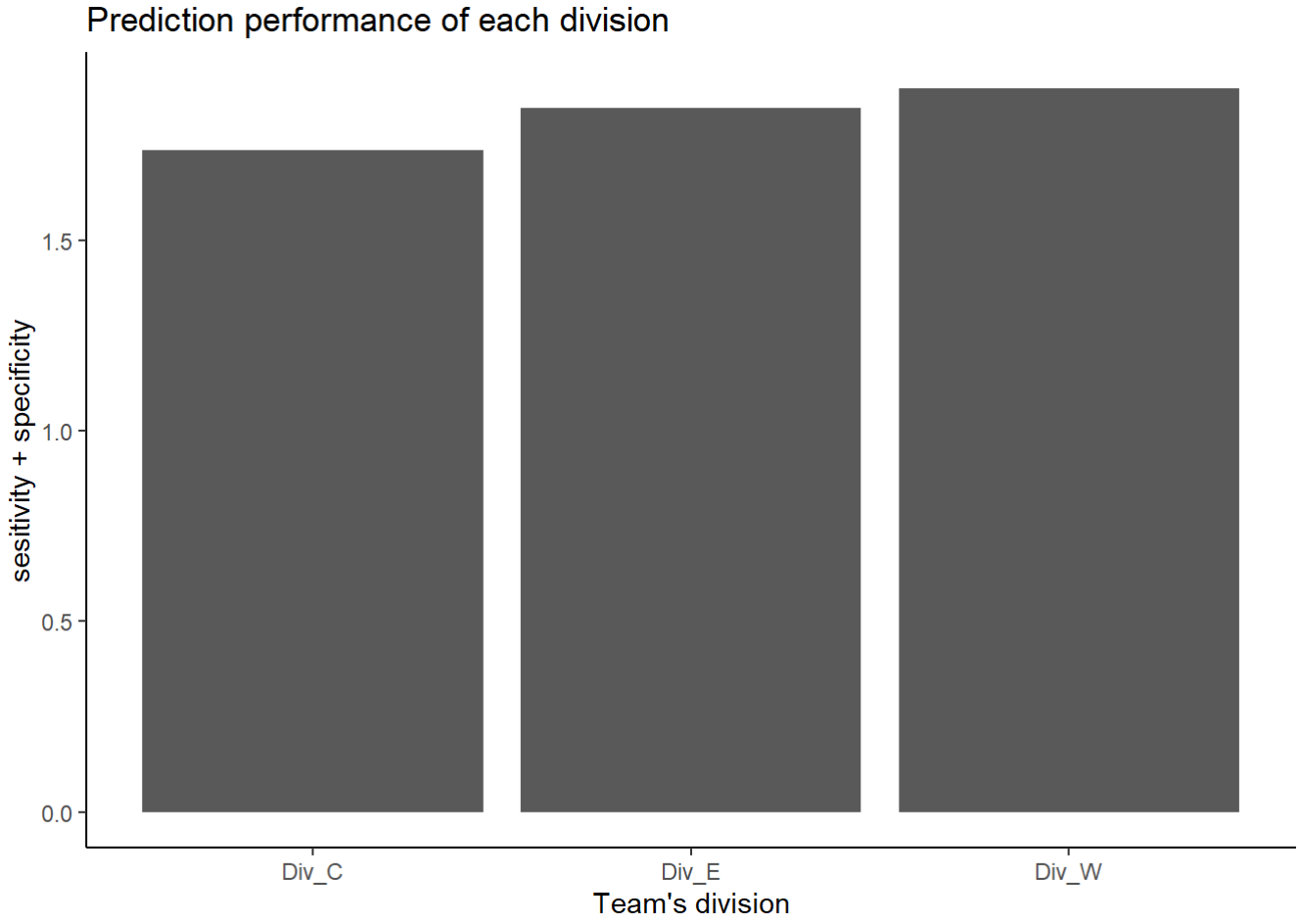
test_div_C <- test.data2 %>%
  filter(divID == "C")          # Filter out division C
div_C_tab <- table(test_div_C$preddivwin, as.factor(test_div_C$DivWin))  # Create confusion m
atrix for calculation later
sens_spe_C <- data_frame(sensitivity(div_C_tab) + specificity(div_C_tab)) %>%
  clean_names() %>%
  rename(sens_spec = sensitivity_div_c_tab_specificity_div_c_tab) %>%
  mutate(divID = "Div_C")       # Create a new data frame include division ID and sensitivity
+ specificity

test_div_W <- test.data2 %>%
  filter(divID == "W")          # Filter out division C
div_W_tab <- table(test_div_W$preddivwin, as.factor(test_div_W$DivWin))  # Create confusion m
atrix for calculation later
sens_spe_W <- data_frame(sensitivity(div_W_tab) + specificity(div_W_tab)) %>%
  clean_names() %>%
  rename(sens_spec = sensitivity_div_w_tab_specificity_div_w_tab) %>%
  mutate(divID = "Div_W")       # Create a new data frame include division ID and sensitivity
+ specificity

divID_df <-sens_spe_E %>%
  bind_rows(sens_spe_C) %>%
  bind_rows(sens_spe_W)         # Bind each division data frame together
divID_df

divID_df %>%
  ggplot(mapping = aes(x = divID, y = sens_spec)) +
  geom_col() +
  labs(x = "Team's division",
```

```
      y = "sesitivity + specificity",
      title = "Prediction performance of each division"
      ) +
  theme_classic()
```




```
# A tibble: 3 x 2
  sens_spec divID
      <dbl> <chr>
1      1.85 Div_E
2      1.74 Div_C
3      1.9  Div_W
```

Disscussion

For Division E we got 1.85 sesitivity + specificity, which means the prediction is 85% better than no model, and 74% for Division C, and 90% for Division W. Division W has slightly better prediction than other 2 division, but overall not a very big difference. Our model is pretty equally good for all three divisions.