

# CS555 R Final Project Notebook

```
library('tidyverse')
```

```
## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr      1.1.4      v readr      2.1.5
## v forcats    1.0.0      v stringr   1.5.1
## v ggplot2    3.5.0      v tibble    3.2.1
## v lubridate  1.9.3      v tidyr     1.3.1
## v purrr      1.0.2
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library('reshape2')
```

```
##
## Attaching package: 'reshape2'
##
## The following object is masked from 'package:tidyr':
##
##      smiths
```

```
library('car')
```

```
## Loading required package: carData
##
## Attaching package: 'car'
##
## The following object is masked from 'package:dplyr':
##
##      recode
##
## The following object is masked from 'package:purrr':
##
##      some
```

## Research Scenario

We have soccer player dataset of 500 rows. With this research we aim to answer the following questions

## Research questions

- Is there a relationship between value and wage of the soccer player ?
- How strong is the relationship ?
- Which other factors are associated with player's wage ?
- How large is the association between each factor and wage ?
- How accurately can we predict wage of the player ?
- Is the relationship linear ?

The goal of the research is to predict wage of the soccer player

## 1. Data Source link

This is the FIFA19 dataset consists of 15 variables such as age, nationality, name, club, jersey number, height, weight, value, wage, reaction, balance, strength etc of a list of 500 soccer players exist in the game who are currently playing in different soccer clubs around the world.

In our analysis we plan to use following variables

- Age (integer): The age of the player.
- Nationality (character): The nationality of the player.
- Overall (integer): The overall rating of the player's skills and abilities.
- Potential (integer): The potential future rating of the player's skills and abilities.
- Club (character): The football club the player is currently associated with.
- Value\_in\_M (double): The market value of the player in millions of dollars.
- Wage\_in\_K (integer): The weekly wage of the player in thousands of dollars.
- Height\_in\_Inches (integer): The height of the player in inches.
- Weight\_in\_lbs (integer): The weight of the player in pounds.
- Reactions (integer): The player's reaction attribute rating.
- Balance (integer): The player's balance attribute rating.
- Strength (integer): The player's strength attribute rating.

```
data <- read.csv('https://raw.githubusercontent.com/kiat/R-Examples/master/projects/datasets/project-10')
data
```

##	ID	Name	Age	Nationality	Overall	Potential
## 1	158023	L. Messi	31	Argentina	94	94
## 2	20801	Cristiano Ronaldo	33	Portugal	94	94
## 3	190871	Neymar Jr	26	Brazil	92	93
## 4	193080	De Gea	27	Spain	91	93
## 5	192985	K. De Bruyne	27	Belgium	91	92
## 6	183277	E. Hazard	27	Belgium	91	91
## 7	177003	L. Modrić	32	Croatia	91	91
## 8	176580	L. Suárez	31	Uruguay	91	91
## 9	155862	Sergio Ramos	32	Spain	91	91
## 10	200389	J. Oblak	25	Slovenia	90	93
## 11	188545	R. Lewandowski	29	Poland	90	90
## 12	182521	T. Kroos	28	Germany	90	90
## 13	182493	D. Godín	32	Uruguay	90	90
## 14	168542	David Silva	32	Spain	90	90
## 15	215914	N. Kanté	27	France	89	90
## 16	211110	P. Dybala	24	Argentina	89	94
## 17	202126	H. Kane	24	England	89	91

## 474	70	181	81	82	75
## 475	71	172	78	73	76
## 476	70	163	77	79	69
## 477	73	159	85	67	67
## 478	70	143	72	79	58
## 479	72	168	75	63	77
## 480	70	174	79	80	80
## 481	72	181	77	63	85
## 482	69	154	78	88	72
## 483	69	168	81	76	74
## 484	76	198	80	47	77
## 485	73	183	76	73	84
## 486	71	170	82	67	83
## 487	75	183	82	67	76
## 488	69	159	80	66	69
## 489	73	176	82	60	78
## 490	71	170	81	73	76
## 491	71	170	80	70	75
## 492	72	170	74	73	63
## 493	72	163	79	60	79
## 494	75	196	66	45	90
## 495	71	159	84	75	74
## 496	74	194	77	42	65
## 497	72	163	74	79	58
## 498	71	163	79	69	56
## 499	69	152	78	85	53
## 500	74	190	81	59	84

```
glimpse(data)
```

```
## Rows: 500
## Columns: 15
## $ ID          <int> 158023, 20801, 190871, 193080, 192985, 183277, 177003~
## $ Name        <chr> "L. Messi", "Cristiano Ronaldo", "Neymar Jr", "De Gea~
## $ Age         <int> 31, 33, 26, 27, 27, 27, 32, 31, 32, 25, 29, 28, 32, 3~
## $ Nationality <chr> "Argentina", "Portugal", "Brazil", "Spain", "Belgium"~
## $ Overall     <int> 94, 94, 92, 91, 91, 91, 91, 91, 91, 90, 90, 90, 90, 9~
## $ Potential   <int> 94, 94, 93, 93, 92, 91, 91, 91, 91, 93, 90, 90, 90, 9~
## $ Club        <chr> "FC Barcelona", "Juventus", "Paris Saint-Germain", "M~
## $ Value_in_M  <dbl> 110.5, 77.0, 118.5, 72.0, 102.0, 93.0, 67.0, 80.0, 51~
## $ Wage_in_K   <int> 565, 405, 290, 260, 355, 340, 420, 455, 380, 94, 205,~
## $ Jersey_Number <int> 10, 7, 10, 1, 7, 10, 10, 9, 15, 1, 9, 8, 10, 21, 13, ~
## $ Height_in_Inches <int> 67, 74, 69, 76, 71, 68, 68, 72, 72, 74, 72, 72, 74, 6~
## $ Weight_in_lbs <int> 159, 183, 150, 168, 154, 163, 146, 190, 181, 192, 176~
## $ Reactions    <int> 95, 96, 94, 90, 91, 90, 90, 92, 85, 86, 90, 89, 85, 9~
## $ Balance      <int> 95, 70, 84, 43, 77, 94, 94, 83, 66, 49, 78, 71, 54, 9~
## $ Strength     <int> 59, 79, 49, 64, 75, 66, 58, 83, 83, 78, 84, 73, 88, 5~
```

## 2. Data Cleaning

Renaming of the club names with proper names with no special characters is done so that data can be parsed and processed. Rows with incorrect column values are removed like players with no wage.

```

data$Club[data$Club == "Atl\u00e9tico Madrid"] <- "Atletico Madrid"
data$Club[data$Club == "FC Bayern M\u00fcnchen"] <- "FC Bayern Munchen"
data$Club[data$Club == "Borussia M\u00f6nchengladbach"] <- "Borussia Monchengladbach"
data$Club[data$Club == "Be\u00f0ikta\u00b0 JK"] <- "Besiktas JK"
data$Club[data$Club == "Fenerbah\u00e7e SK"] <- "Fenerbahce SK"
data$Club[data$Club == "Gr\u00eamio"] <- "Gremio"
data$Club[data$Club == "AS Saint-\u00c9tienne"] <- "AS Saint Etienne"
data$Club[data$Club == "Medipol Ba\u00f0ak\u00e7ehir FK"] <- "Basaksehir FK"
data$Club[data$Club == "Borussia M\u00f6nchengladbach"] <- "Borussia Monchengladbach"
data$Club[data$Club == "1. FC K\u00f6ln"] <- "1. FC Koln"
data$Club[data$Club == "Deportivo Alav\u00e9s"] <- "Deportivo Alaves"
data$Club[data$Club == "Guangzhou R&F; FC"] <- "Guangzhou City F.C."
data$Club[data$Club == "Atl\u00e9tico Mineiro"] <- "Atletico Mineiro"

data <- data[data$Wage_in_K!=0,]
names(data) <- make.names(names(data))

write.csv(data, 'clean_data.csv')

```

### 3. Data Analysis

Various statistical methods like **Correlation tests**, **Simple Linear Regression**, **Multiple Linear Regression**, **ANOVA** and **ANCOVA** are used for analysis

#### Correlation test

Check whether value of the player is associated with the his wage ?

```

attach(data)
view(data)

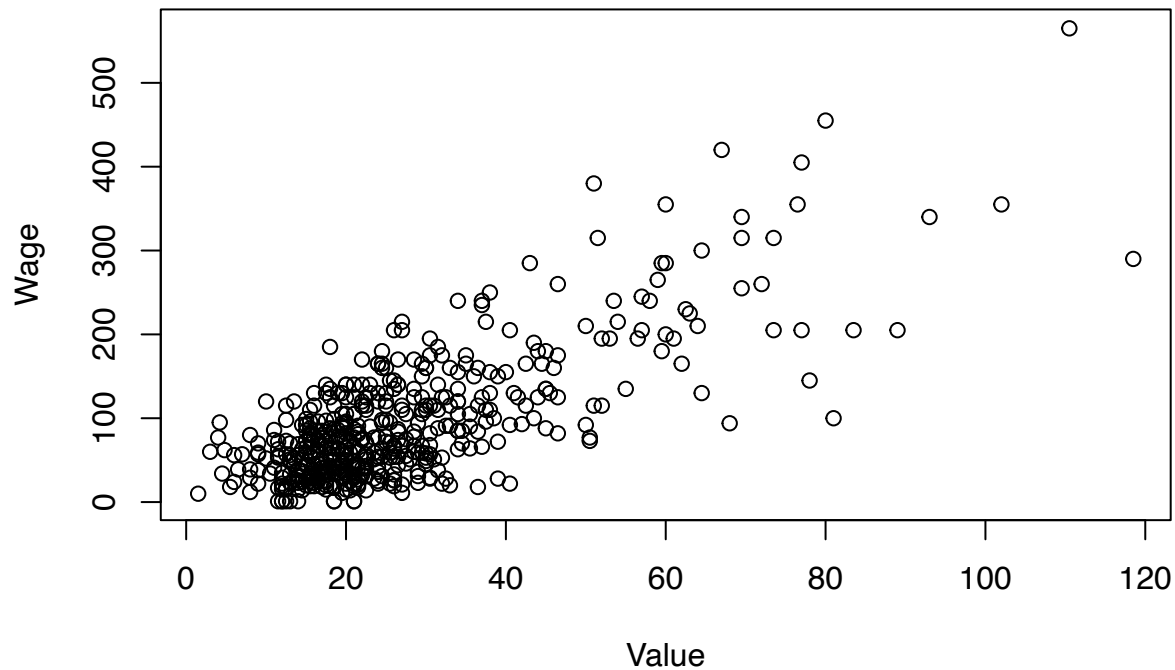
```

```

plot( Value_in_M, Wage_in_K, xlab = 'Value', ylab = 'Wage', main = 'Relation between wage and value of '

```

## Relation between wage and value of the player



```
cor(Value_in_M, Wage_in_K)
```

```
## [1] 0.7531636
```

The correlation coefficient of **0.75** indicates *value* of the player is **strongly** associated with his *wage* and the direction is **positive**.

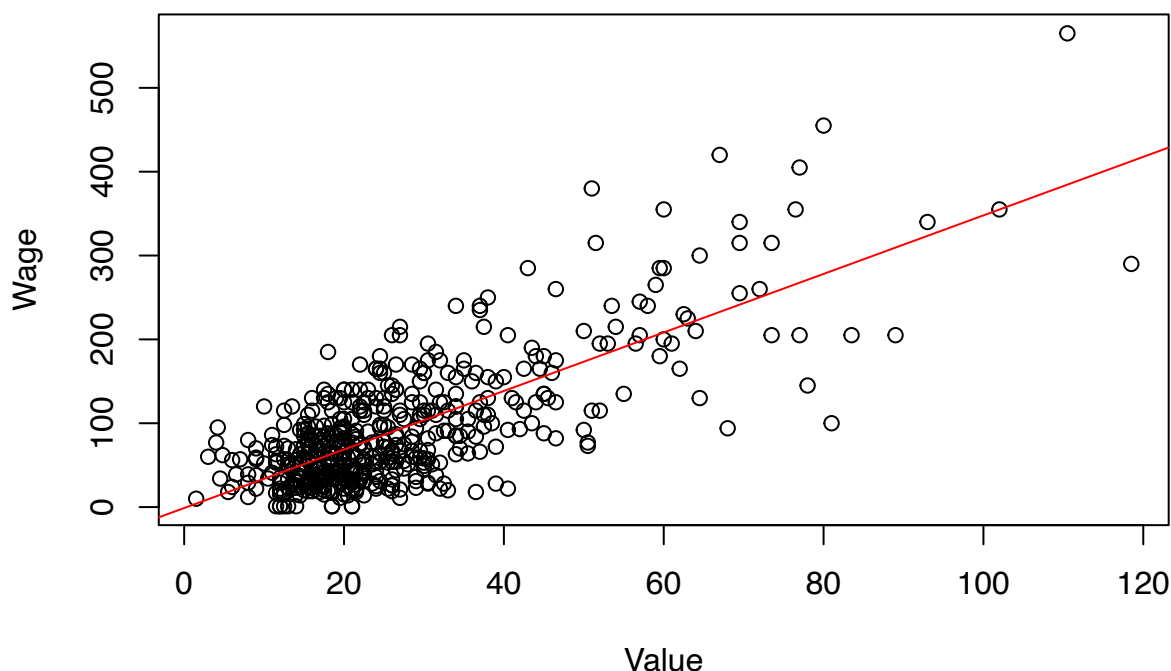
### 3.1 Simple Least Square Linear Regression

$$\text{wage} = f(\text{value})$$

$$Y_{\text{wage}} = \beta_0 + \beta_1 \times x_{\text{value}}$$

```
# SLR
m <- lm(Wage_in_K ~ Value_in_M)
# plot SLR
plot( Value_in_M, Wage_in_K, xlab = 'Value', ylab = 'Wage', main = 'SLR between wage and value of player',
      abline(m, col='red'))
```

## SLR between wage and value of player



```
# SLR summary
summary(m)
```

```
##
## Call:
## lm(formula = Wage_in_K ~ Value_in_M)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -181.579  -32.366   -4.686   27.449  203.132
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.1410     4.3343  -0.263   0.792
## Value_in_M    3.4904     0.1367  25.524 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 50.31 on 497 degrees of freedom
## Multiple R-squared:  0.5673, Adjusted R-squared:  0.5664
## F-statistic: 651.5 on 1 and 497 DF, p-value: < 2.2e-16
```

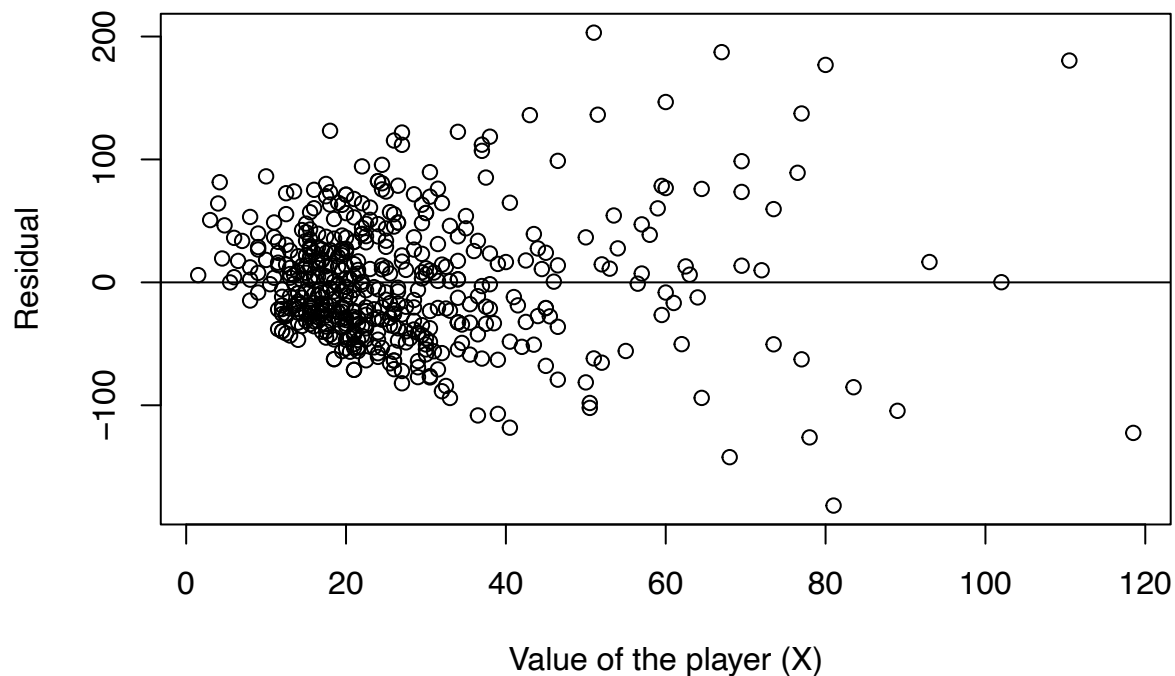
```
# CI of coefficients
upper.c1 <- coef(m)[1]+qt(0.95,500-2)*4.3343
lower.c1 <- coef(m)[1]-qt(0.95,500-2)*4.3343

upper.value <- coef(m)[2]+qt(0.95,500-2)*0.1367
lower.value <- coef(m)[2]-qt(0.95,500-2)*0.1367
```

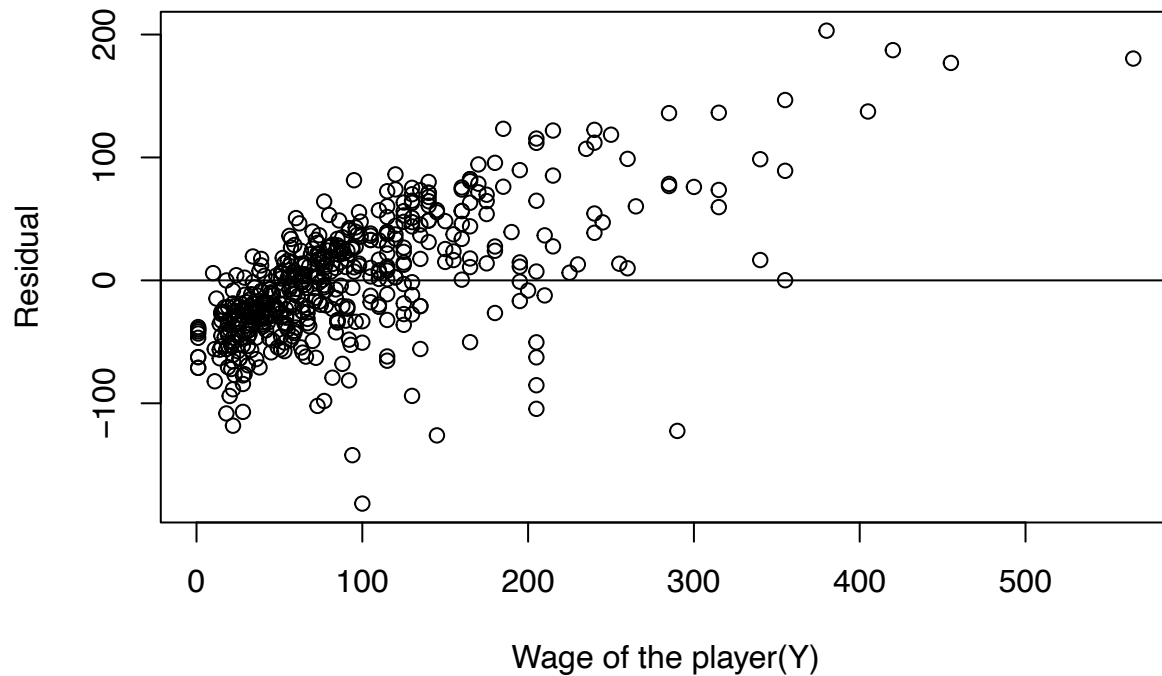
- As **p-value** of the model « **0.05** for  $\alpha=0.05$ , model is **significant**. Hence there is good evidence that **Value** is significant predictor of **Wage**.
- **Value** predictor explains **56.8%** of variance in **Wage**.
- **95% confidence interval** for  $\beta_0$  is  $[-8.28, 6]$  and the 95% confidence interval for  $\beta_1$  is  $[3.27, 3.72]$ . Therefore we can conclude that if the player has no value, his wage will fall between 0 to 6K dollars. Furthermore, for each 100 million increase in value of the player, there will be an average increase in wage of between 327K to 372K dollars.

#### - Residual plot analysis

```
plot(Value_in_M, residuals(m), xlab = 'Value of the player (X)', ylab = 'Residual')
abline(h=0)
```

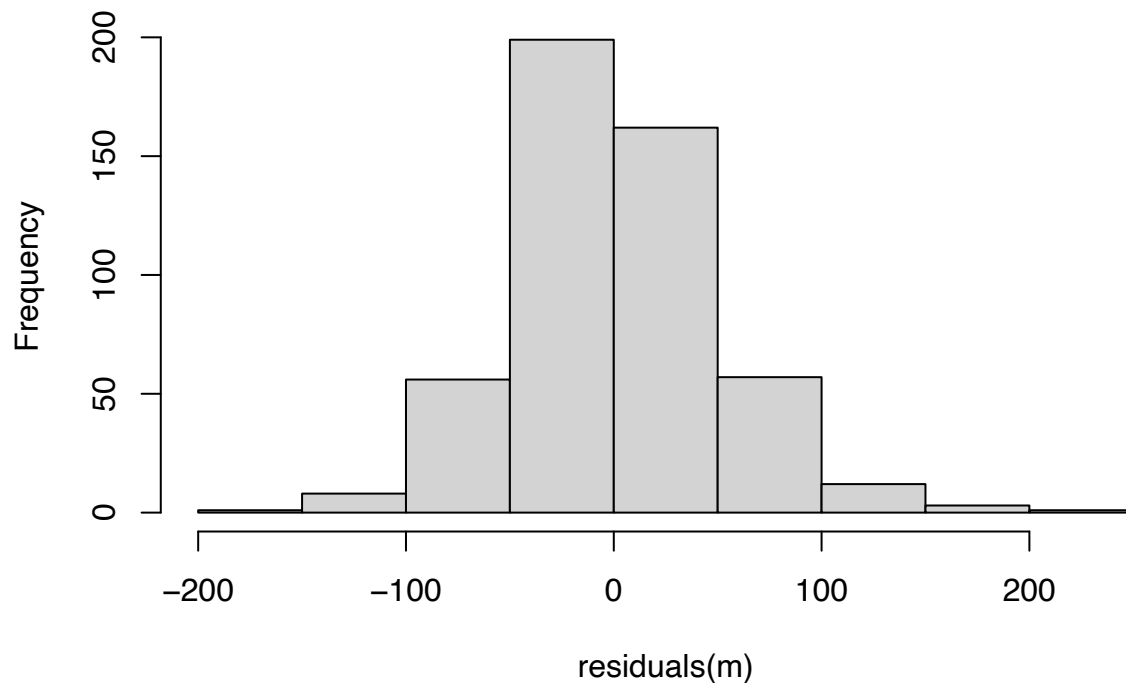


```
plot(Wage_in_K, residuals(m), xlab = 'Wage of the player(Y)', ylab = 'Residual')
abline(h=0)
```



```
hist(residuals(m))
```

**Histogram of residuals(m)**



- Clear **obvious pattern** emerges in residual plot.
- As X increase **variability** of outcome increase.
- Residuals are normally distributed.
- It clearly **violates** the linearity and constant variance assumptions. Hence, non-linear relationship exist between the factors Wage and value.



## - Transformation

```
new.data <- data[Wage_in_K!=0,]
```

## - Take log of response variable

$$\log(Y_{wage}) = \beta_0 + \beta_1 x_{value}$$

```
cor(new.data$Value_in_M, log(new.data$Wage_in_K))
```

```
## [1] 0.5492958
```

```
m <- lm(log(new.data$Wage_in_K)~new.data$Value_in_M)
summary(m)
```

```
##
## Call:
## lm(formula = log(new.data$Wage_in_K) ~ new.data$Value_in_M)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.9942 -0.3337  0.1350  0.5066  1.3229
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      3.316942   0.069754   47.55  <2e-16 ***
## new.data$Value_in_M 0.032251   0.002201   14.65  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.8097 on 497 degrees of freedom
## Multiple R-squared:  0.3017, Adjusted R-squared:  0.3003
## F-statistic: 214.8 on 1 and 497 DF,  p-value: < 2.2e-16
```

Strength of linear relationship (correlation) decreases to 0.54. R2 of model 0.30

## - Take square root of response variable

$$\sqrt{Y_{wage}} = \beta_0 + \beta_1 x_{value}$$

```
cor(sqrt(data$Wage_in_K), Value_in_M)
```

```
## [1] 0.7000824
```

```
m <- lm(sqrt(data$Wage_in_K)~Value_in_M)
summary(m)
```

```
##
## Call:
## lm(formula = sqrt(data$Wage_in_K) ~ Value_in_M)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -7.2844 -1.7142  0.0043  1.8329  6.8443
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.769579   0.224050   21.29  <2e-16 ***
## Value_in_M   0.154504   0.007069   21.86  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.601 on 497 degrees of freedom
## Multiple R-squared:  0.4901, Adjusted R-squared:  0.4891
## F-statistic: 477.7 on 1 and 497 DF,  p-value: < 2.2e-16
```

Correlation is 0.70, R2 is 0.49

- Squaring explanatory variable

$$Y_{wage} = \beta_0 + \beta_1 x_{value}^2$$

```
cor(Wage_in_K, Value_in_M**2)
```

```
## [1] 0.7248201
```

```
m <- lm(Wage_in_K~Value_in_M**2)
summary(m)
```

```
##
## Call:
## lm(formula = Wage_in_K ~ Value_in_M^2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -181.579  -32.366   -4.686    27.449   203.132
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.1410     4.3343  -0.263   0.792
## Value_in_M     3.4904     0.1367  25.524  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 50.31 on 497 degrees of freedom
## Multiple R-squared:  0.5673, Adjusted R-squared:  0.5664
## F-statistic: 651.5 on 1 and 497 DF,  p-value: < 2.2e-16
```

Correlation is 0.72 and R2 of model is 0.57

### - Log of explanatory variable

$$Y_{wage} = \beta_0 + \log(\beta_1 x_{value})$$

```
new.data <- data[Value_in_M!=0,]  
cor(new.data$Wage_in_K, log(new.data$Value_in_M))
```

```
## [1] 0.6569803
```

```
m <- lm(new.data$Wage_in_K~log(new.data$Value_in_M))  
summary(m)
```

```
##  
## Call:  
## lm(formula = new.data$Wage_in_K ~ log(new.data$Value_in_M))  
##  
## Residuals:  
##      Min       1Q   Median       3Q      Max   
## -121.87  -39.25   -8.77   29.12  329.60   
##  
## Coefficients:  
##              Estimate Std. Error t value Pr(>|t|)      
## (Intercept)    -193.683     15.000  -12.91  <2e-16 ***  
## log(new.data$Value_in_M)   91.197      4.694   19.43  <2e-16 ***  
## ---  
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
##  
## Residual standard error: 57.66 on 497 degrees of freedom  
## Multiple R-squared:  0.4316, Adjusted R-squared:  0.4305   
## F-statistic: 377.4 on 1 and 497 DF,  p-value: < 2.2e-16
```

Correlation is 0.66 and R2 of model is 0.43

### - Polynomial regression

$$Y_{wage} = \beta_0 + \beta_1 x_{value} + \beta_2 x_{value}^2$$

```
m <- lm(Wage_in_K ~ Value_in_M + I(Value_in_M**2))  
summary(m)
```

```
##  
## Call:  
## lm(formula = Wage_in_K ~ Value_in_M + I(Value_in_M^2))  
##  
## Residuals:  
##      Min       1Q   Median       3Q      Max   
## -186.498  -30.620   -5.171   27.378  205.874   
##  
## Coefficients:  
##              Estimate Std. Error t value Pr(>|t|)      
## (Intercept)    6.514653   7.608037   0.856   0.392      
## Value_in_M     2.997326   0.425343   7.047 6.16e-12 ***  
## I(Value_in_M^2) 0.005670   0.004632   1.224   0.222
```

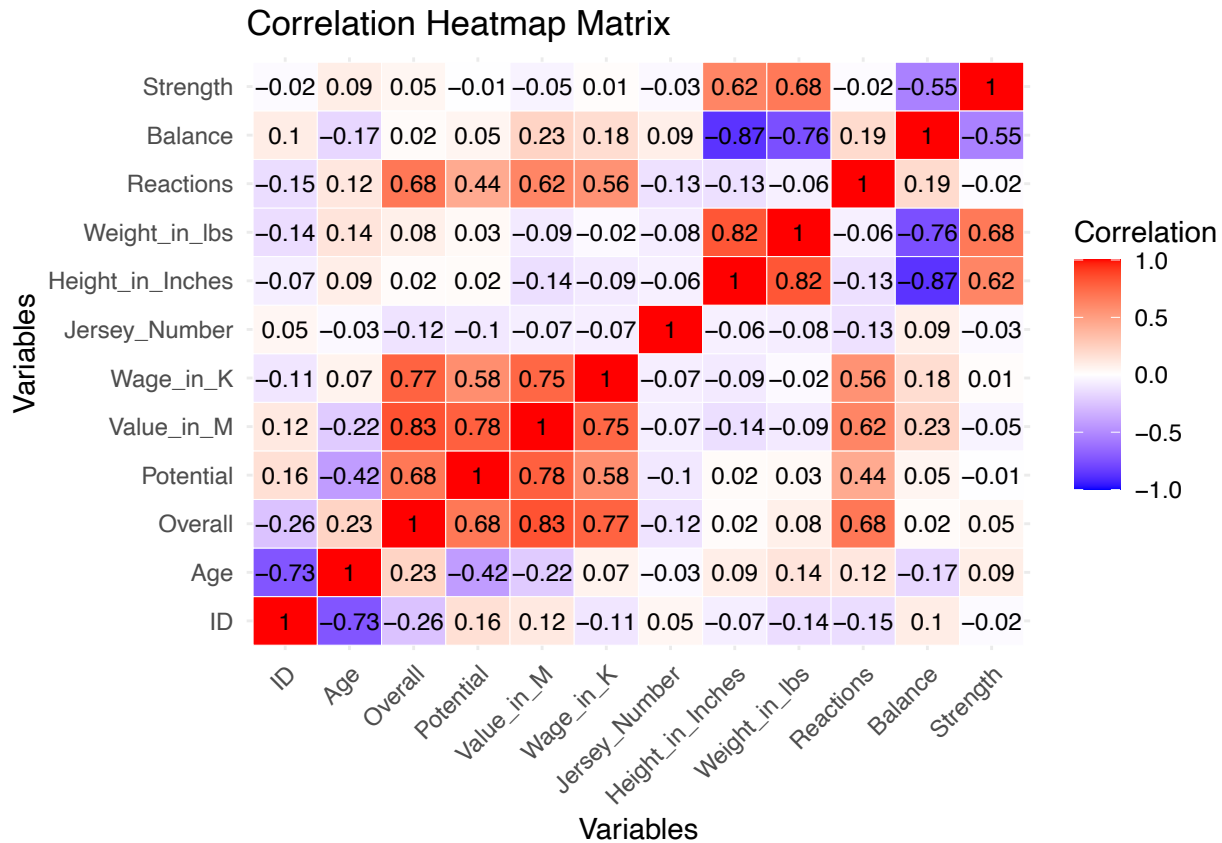
```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 50.29 on 496 degrees of freedom
## Multiple R-squared:  0.5686, Adjusted R-squared:  0.5668
## F-statistic: 326.8 on 2 and 496 DF,  p-value: < 2.2e-16
```

- Model is significant but **R<sup>2</sup>** is same and the coefficient of newly added quadratic term is insignificant, by t-test.
- By doing **transformations**, we saw that the **correlation** between Wage and Value of the player **reduces** which in turn **drops** linear model's performance. Even with the transformations we don't have sufficient evidence of linear relationship between wage and value of the player, there may be other factors that cause variation in wage.

## - Corelation Matrix

```
numeric_cols <- data %>% select_if(is.numeric)

cor_matrix <- cor(numeric_cols)
cor_matrix_melted <- melt(cor_matrix)
ggplot(cor_matrix_melted, aes(Var1, Var2, fill = value, label = round(value, 2))) +
  geom_tile(color = "white") +
  geom_text(size = 3, color = "black") + # Add text labels for correlation coefficients
  scale_fill_gradient2(low = "blue", high = "red", mid = "white",
                      midpoint = 0, limit = c(-1, 1),
                      space = "Lab", name = "Correlation") +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1)) +
  labs(title = "Correlation Heatmap Matrix", x = "Variables", y = "Variables")
```



- From the above plot we can see that **Overall score** and **Value** variables have strong association with the **wage** of the player.
- **Reactions, Potential** variables are moderately associated.
- While the **Balance, Strength** and **Age** are weakly associated.

### 3.2 Multiple Linear Regression

```
mlr.m2 <- lm(Wage_in_K ~ Value_in_M+Overall+Balance+Strength+Potential+Age+Height_in_Inches+Weight_in_lbs, data = data)
mlr.m2 <- lm(Wage_in_K ~ Value_in_M+Overall+Balance+Strength+Potential+Age+Height_in_Inches+Reactions, data = data)
mlr.m2 <- lm(Wage_in_K ~ Value_in_M+Overall+Balance+Strength+Potential+Age+Reactions, data = data)
mlr.m2 <- lm(Wage_in_K ~ Value_in_M+Overall+Balance+Strength+Potential+Age, data = data)
mlr.m2 <- lm(Wage_in_K ~ Value_in_M+Overall+Balance+Strength+Age, data = data)
mlr.m2 <- lm(Wage_in_K ~ Value_in_M+Overall+Balance+Strength, data = data)
summary(mlr.m2)
```

```
##
## Call:
## lm(formula = Wage_in_K ~ Value_in_M + Overall + Balance + Strength,
##     data = data)
```

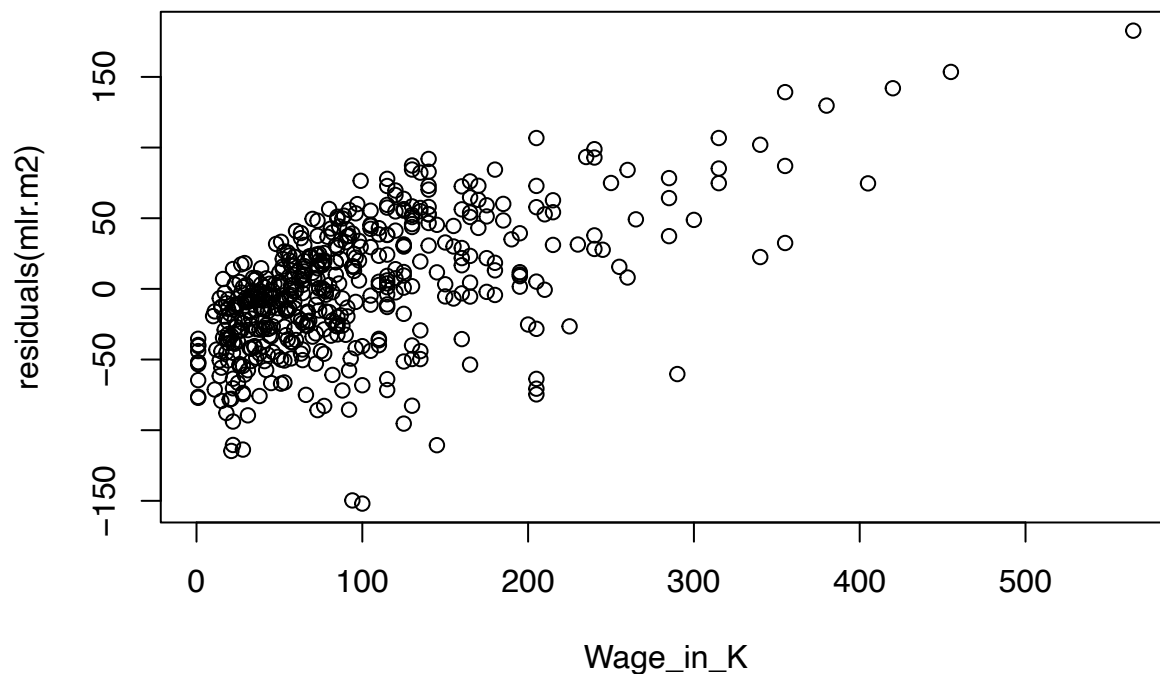
```
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -151.935  -28.970   -2.351   29.053  182.708
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1254.9040    118.9695  -10.548 < 2e-16 ***
## Value_in_M      1.3493     0.2416    5.585 3.87e-08 ***
## Overall      14.7718     1.4419   10.245 < 2e-16 ***
## Balance       0.7077     0.1629    4.344 1.70e-05 ***
## Strength      0.5477     0.2078    2.636 0.00866 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 45.56 on 494 degrees of freedom
## Multiple R-squared:  0.6472, Adjusted R-squared:  0.6444
## F-statistic: 226.6 on 4 and 494 DF,  p-value: < 2.2e-16
```

## MLR Model Summary

	MLR Model	Global test	Adjusted R2	Insignificant variable(s) \(\alpha=0.05\)
1.	$Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{potential} + \beta_3 x_{value} + \beta_4 x_{reaction} + \beta_5 x_{balance} + \beta_6 x_{strength} + \beta_7 x_{age} + \beta_8 x_{weight} + \beta_9 x_{height}$	Significant	\(0.6465\)	potential, reactions, strength, weight, height
2.	$Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{potential} + \beta_3 x_{value} + \beta_4 x_{reaction} + \beta_5 x_{balance} + \beta_6 x_{strength} + \beta_7 x_{age} + \beta_8 x_{height}$	Significant	\(0.6528\)	potential, strength, height, reactions
3.	$Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{potential} + \beta_3 x_{value} + \beta_4 x_{reaction} + \beta_5 x_{balance} + \beta_6 x_{strength} + \beta_7 x_{age}$	Significant	\(0.6461\)	reactions, potential
4.	$Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{potential} + \beta_3 x_{value} + \beta_4 x_{balance} + \beta_5 x_{strength} + \beta_6 x_{age}$	Significant	\(0.6467\)	potential
5.	$Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{value} + \beta_3 x_{balance} + \beta_4 x_{strength} + \beta_5 x_{age}$	Significant	\(0.647\)	age
6.	$Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{value} + \beta_3 x_{balance} + \beta_4 x_{strength}$	Significant	\(0.6457\)	

- All models have almost same **R2** value with **marginal differences**.
- All the models explain around **64.5%** variability in player's *wage*.
- The model  $Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{value} + \beta_3 x_{balance} + \beta_4 x_{strength}$  is the best MLR model as it explains the **same** amount of **variation** with **less variables**.
- Hence important variables in determining wage are, player's *value*, *potential*, *balance* and *strength*.
- MLR model has better R2 of **64.5%** than that of SLR model of **56%**. Hence it explains **greater** variability in Y.

```
plot(Wage_in_K, residuals(mlr.m2))
```



- Adding group variable Club

```
length(unique(Club))
```

```
## [1] 91
```

```
length(unique(Nationality))
```

```
## [1] 59
```

In the dataset there are 92 different Clubs from 59 different Nationality.

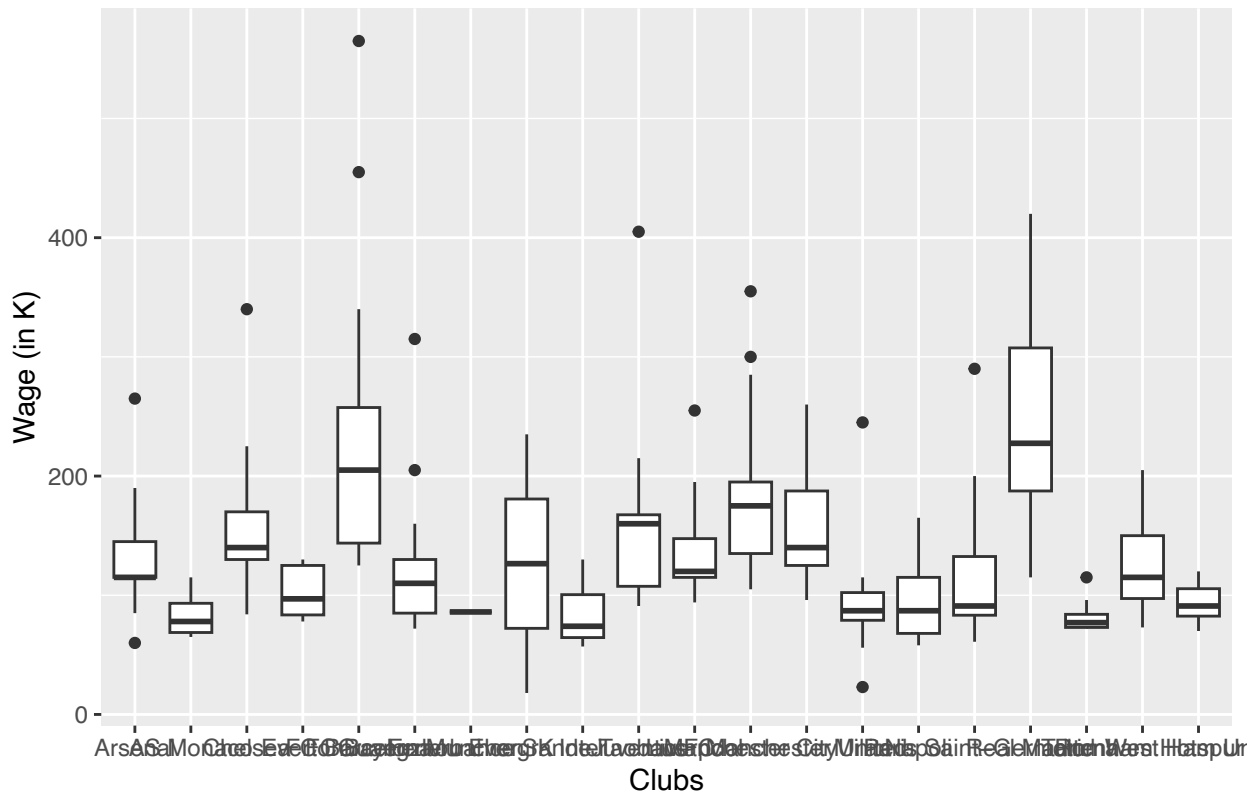
- Distribution of Wage across Clubs

Select top 20 Clubs with highest mean wage

```
# get top 20 clubs by highest mean wage
data %>% group_by(Club) %>% summarise(Mean_Wage = mean(Wage_in_K)) %>% arrange(desc(Mean_Wage)) %>% select(Club, Mean_Wage)
data %>% filter(Club %in% top.clubs$Club) -> top.clubs.data
```

```
options(repr.plot.width = 100, repr.plot.height = 6)
ggplot(data=top.clubs.data, aes(x=Club, y=Wage_in_K)) +
  geom_boxplot()+
  labs(x = "Clubs", y = "Wage (in K)", title = 'Distribution of Wage across Clubs')
```

## Distribution of Wage across Clubs



Club with the mean highest wage is *Real Madrid* followed by FC Barcelona and Manchester City.

- Does a player's wage differ across soccer clubs ?

ANOVA Test

$$\text{wage} = f(\text{club})$$

```
m <- aov(Wage_in_K ~ Club, data=data)
```

```
summary(m)
```

```
##           Df Sum Sq Mean Sq F value Pr(>F)
## Club       90 1962560   21806    9.419 <2e-16 ***
## Residuals  408  944569    2315
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

As p-value of **Club** in anova model « 0.05. we have significant evidence that wage of the player **varies** by Clubs they play for. Therefore wages change depending on the different Clubs.

```
# pairwise t-test using bonferroni method
pairwise.t.test(Wage_in_K, Club, data=data, p.adj='bonferroni')
```

```
##
## Pairwise comparisons using t tests with pooled SD
```



```

##
## data: Wage_in_K and Club
##
##                                1. FC Koln Ajax Al Hilal Al Nassr Arsenal
## Ajax                          -          -          -          -
## Al Hilal                      -          -          -          -
## Al Nassr                     -          -          -          -
## Arsenal                      -          -          -          -
## AS Monaco                    -          -          -          -
## AS Saint Etienne             -          -          -          -
## Atalanta                   -          -          -          -
## Athletic Club de Bilbao      -          -          -          -
## Atlanta United               -          -          -          -
## Atletico Madrid              -          -          -          -
## Atletico Mineiro             -          -          -          -
## Basaksehir FK               -          -          -          -
## Bayer 04 Leverkusen          -          -          -          -
## Beijing Sinobo Guoan FC      -          -          -          -
## Besiktas JK                 -          -          -          -
## Borussia Dortmund            -          -          -          -
## Borussia Monchengladbach     -          -          -          -
## Burnley                     -          -          -          -
## Chelsea                     -          -          -          -
## Cruzeiro                    -          -          -          -
## Crystal Palace              -          -          -          -
## Dalian YiFang FC             -          -          -          -
## Deportivo Alaves             -          -          -          -
## Eintracht Frankfurt          -          -          -          -
## Everton                     -          -          -          -
## FC Barcelona                 -          -          -          -
## FC Bayern Munchen            -          -          -          -
## FC Porto                    -          -          -          -
## FC Schalke 04                -          -          -          -
## Fenerbahce SK                -          -          -          -
## Fluminense                   -          -          -          -
## Fulham                      -          -          -          -
## Galatasaray SK              -          -          -          -
## Girona FC                   -          -          -          -
## Gremio                      -          -          -          -
## Guangzhou City F.C.          -          -          -          -
## Guangzhou Evergrande Taobao FC -          -          -          -
## Hertha BSC                   -          -          -          -
## Inter                       -          -          -          -
## Juventus                     -          -          -          -
## LA Galaxy                    -          -          -          -
## Lazio                       -          -          -          -
## Leicester City               -          -          -          -
## Levante UD                   -          -          -          -
## Liverpool                    -          -          -          -
## Lokomotiv Moscow             -          -          -          -
## Los Angeles FC               -          -          -          -
## Manchester City              -          -          -          -
## Manchester United            -          -          -          -
## Milan                       -          -          -          -

```

## Montpellier HSC	-	-	-	-	-
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## New York City FC	-	-	-	-	-
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## Olympique de Marseille	-	-	-	-	-
## Olympique Lyonnais	-	-	-	-	-
## Paris Saint-Germain	-	-	-	-	-
## PFC CSKA Moscow	-	-	-	-	-
## PSV	-	-	-	-	-
## RB Leipzig	-	-	-	-	-
## RC Celta	-	-	-	-	-
## Real Betis	-	-	-	-	-
## Real Madrid	-	-	-	-	-
## Real Sociedad	-	-	-	-	-
## River Plate	-	-	-	-	-
## Roma	-	-	-	-	-
## Sampdoria	-	-	-	-	-
## Sassuolo	-	-	-	-	-
## SC Braga	-	-	-	-	-
## SD Eibar	-	-	-	-	-
## Sevilla FC	-	-	-	-	-
## Shakhtar Donetsk	-	-	-	-	-
## Shanghai SIPG FC	-	-	-	-	-
## SL Benfica	-	-	-	-	-
## Southampton	-	-	-	-	-
## Sporting CP	-	-	-	-	-
## Stoke City	-	-	-	-	-
## SV Werder Bremen	-	-	-	-	-
## Torino	-	-	-	-	-
## Toronto FC	-	-	-	-	-
## Tottenham Hotspur	-	-	-	-	-
## TSG 1899 Hoffenheim	-	-	-	-	-
## Valencia CF	-	-	-	-	-
## VfB Stuttgart	-	-	-	-	-
## VfL Wolfsburg	-	-	-	-	-
## Villarreal CF	-	-	-	-	-
## Vissel Kobe	-	-	-	-	-
## Watford	-	-	-	-	-
## West Ham United	-	-	-	-	-
## Wolverhampton Wanderers	-	-	-	-	-
##	AS Monaco	AS Saint Etienne	Atalanta		
## Ajax	-	-	-		
## Al Hilal	-	-	-		
## Al Nassr	-	-	-		
## Arsenal	-	-	-		
## AS Monaco	-	-	-		
## AS Saint Etienne	-	-	-		
## Atalanta	-	-	-		
## Athletic Club de Bilbao	-	-	-		
## Atlanta United	-	-	-		
## Atletico Madrid	-	-	-		
## Atletico Mineiro	-	-	-		
## Basaksehir FK	-	-	-		
## Bayer 04 Leverkusen	-	-	-		

## Beijing Sinobo Guoan FC	-	-	-
## Besiktas JK	-	-	-
## Borussia Dortmund	-	-	-
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## FC Bayern Munchen	-	-	-
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## FC Schalke 04	-	-	-
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## Girona FC	-	-	-
## Gremio	-	-	-
## Guangzhou City F.C.	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-
## Hertha BSC	-	-	-
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## Juventus	-	-	-
## LA Galaxy	-	-	-
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## Napoli	-	-	-
## New York City FC	-	-	-
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## Al Nassr	-	-	-
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## Watford	-	-	-
## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	Bayer 04 Leverkusen	Beijing Sinobo	Guoan FC
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## Al Nassr	-	-	
## Arsenal	-	-	
## AS Monaco	-	-	
## AS Saint Etienne	-	-	
## Atalanta	-	-	
## Athletic Club de Bilbao	-	-	
## Atlanta United	-	-	
## Atletico Madrid	-	-	

## Atletico Mineiro	-	-
## Basaksehir FK	-	-
## Bayer 04 Leverkusen	-	-
## Beijing Sinobo Guoan FC	-	-
## Besiktas JK	-	-
## Borussia Dortmund	-	-
## Borussia Monchengladbach	-	-
## Burnley	-	-
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## Dalian YiFang FC	-	-
## Deportivo Alaves	-	-
## Eintracht Frankfurt	-	-
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## FC Porto	-	-
## FC Schalke 04	-	-
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## Galatasaray SK	-	-
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## Gremio	-	-
## Guangzhou City F.C.	-	-
## Guangzhou Evergrande Taobao FC	-	-
## Hertha BSC	-	-
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## Juventus	-	-
## LA Galaxy	-	-
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## Levante UD	-	-
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## Lokomotiv Moscow	-	-
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## Napoli	-	-
## New York City FC	-	-
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## Olympique de Marseille	-	-
## Olympique Lyonnais	-	-
## Paris Saint-Germain	-	-
## PFC CSKA Moscow	-	-
## PSV	-	-
## RB Leipzig	-	-
## RC Celta	-	-
## Real Betis	-	-
## Real Madrid	-	-
## Real Sociedad	-	-



## River Plate	-	-
## Roma	-	-
## Sampdoria	-	-
## Sassuolo	-	-
## SC Braga	-	-
## SD Eibar	-	-
## Sevilla FC	-	-
## Shakhtar Donetsk	-	-
## Shanghai SIPG FC	-	-
## SL Benfica	-	-
## Southampton	-	-
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## SV Werder Bremen	-	-
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## Tottenham Hotspur	-	-
## TSG 1899 Hoffenheim	-	-
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## VfB Stuttgart	-	-
## VfL Wolfsburg	-	-
## Villarreal CF	-	-
## Vissel Kobe	-	-
## Watford	-	-
## West Ham United	-	-
## Wolverhampton Wanderers	-	-
##	Besiktas JK	Borussia Dortmund
## Ajax	-	-
## Al Hilal	-	-
## Al Nassr	-	-
## Arsenal	-	-
## AS Monaco	-	-
## AS Saint Etienne	-	-
## Atalanta	-	-
## Athletic Club de Bilbao	-	-
## Atlanta United	-	-
## Atletico Madrid	-	-
## Atletico Mineiro	-	-
## Basaksehir FK	-	-
## Bayer 04 Leverkusen	-	-
## Beijing Sinobo Guoan FC	-	-
## Besiktas JK	-	-
## Borussia Dortmund	-	-
## Borussia Monchengladbach	-	-
## Burnley	-	-
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## Cruzeiro	-	-
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## Dalian YiFang FC	-	-
## Deportivo Alaves	-	-
## Eintracht Frankfurt	-	-
## Everton	-	-
## FC Barcelona	-	-
## FC Bayern Munchen	-	-

## FC Porto	-	-
## FC Schalke 04	-	-
## Fenerbahce SK	-	-
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## Leicester City	-	-
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## Lokomotiv Moscow	-	-
## Los Angeles FC	-	-
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## PFC CSKA Moscow	-	-
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## RB Leipzig	-	-
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## Sevilla FC	-	-
## Shakhtar Donetsk	-	-
## Shanghai SIPG FC	-	-
## SL Benfica	-	-
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## Villarreal CF	-	-	
## Vissel Kobe	-	-	
## Watford	-	-	
## West Ham United	-	-	
## Wolverhampton Wanderers	-	-	
##			Borussia Monchengladbach Burnley Chelsea
## Ajax	-	-	-
## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-
## AS Monaco	-	-	-
## AS Saint Etienne	-	-	-
## Atalanta	-	-	-
## Athletic Club de Bilbao	-	-	-
## Atlanta United	-	-	-
## Atletico Madrid	-	-	-
## Atletico Mineiro	-	-	-
## Basaksehir FK	-	-	-
## Bayer 04 Leverkusen	-	-	-
## Beijing Sinobo Guoan FC	-	-	-
## Besiktas JK	-	-	-
## Borussia Dortmund	-	-	-
## Borussia Monchengladbach	-	-	-
## Burnley	-	-	-
## Chelsea	-	-	-
## Cruzeiro	-	-	-
## Crystal Palace	-	-	-
## Dalian YiFang FC	-	-	-
## Deportivo Alaves	-	-	-
## Eintracht Frankfurt	-	-	-
## Everton	-	-	-
## FC Barcelona	-	-	-
## FC Bayern Munchen	-	-	-
## FC Porto	-	-	-
## FC Schalke 04	-	-	-
## Fenerbahce SK	-	-	-
## Fluminense	-	-	-
## Fulham	-	-	-
## Galatasaray SK	-	-	-
## Girona FC	-	-	-
## Gremio	-	-	-
## Guangzhou City F.C.	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-
## Hertha BSC	-	-	-
## Inter	-	-	-
## Juventus	-	-	-
## LA Galaxy	-	-	-
## Lazio	-	-	-
## Leicester City	-	-	-
## Levante UD	-	-	-

## Liverpool	-	-	-
## Lokomotiv Moscow	-	-	-
## Los Angeles FC	-	-	-
## Manchester City	-	-	-
## Manchester United	-	-	-
## Milan	-	-	-
## Montpellier HSC	-	-	-
## Napoli	-	-	-
## New York City FC	-	-	-
## OGC Nice	-	-	-
## Olympique de Marseille	-	-	-
## Olympique Lyonnais	-	-	-
## Paris Saint-Germain	-	-	-
## PFC CSKA Moscow	-	-	-
## PSV	-	-	-
## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
## Real Madrid	-	-	-
## Real Sociedad	-	-	-
## River Plate	-	-	-
## Roma	-	-	-
## Sampdoria	-	-	-
## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
## Shanghai SIPG FC	-	-	-
## SL Benfica	-	-	-
## Southampton	-	-	-
## Sporting CP	-	-	-
## Stoke City	-	-	-
## SV Werder Bremen	-	-	-
## Torino	-	-	-
## Toronto FC	-	-	-
## Tottenham Hotspur	-	-	-
## TSG 1899 Hoffenheim	-	-	-
## Valencia CF	-	-	-
## VfB Stuttgart	-	-	-
## VfL Wolfsburg	-	-	-
## Villarreal CF	-	-	-
## Vissel Kobe	-	-	-
## Watford	-	-	-
## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	Cruzeiro	Crystal Palace	Dalian YiFang FC
## Ajax	-	-	-
## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-
## AS Monaco	-	-	-
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## Atalanta	-	-	-

## Athletic Club de Bilbao	-	-	-
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## Atletico Madrid	-	-	-
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## Basaksehir FK	-	-	-
## Bayer 04 Leverkusen	-	-	-
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## Everton	-	-	-
## FC Barcelona	-	-	-
## FC Bayern Munchen	-	-	-
## FC Porto	-	-	-
## FC Schalke 04	-	-	-
## Fenerbahce SK	-	-	-
## Fluminense	-	-	-
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## Galatasaray SK	-	-	-
## Girona FC	-	-	-
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## Leicester City	-	-	-
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## Lokomotiv Moscow	-	-	-
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## Manchester City	-	-	-
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## Montpellier HSC	-	-	-
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## Olympique Lyonnais	-	-	-
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## RB Leipzig	-	-	-
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## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
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## Tottenham Hotspur	-	-	-
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## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	Deportivo Alaves	Eintracht Frankfurt	Everton
## Ajax	-	-	-
## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-
## AS Monaco	-	-	-
## AS Saint Etienne	-	-	-
## Atalanta	-	-	-
## Athletic Club de Bilbao	-	-	-
## Atlanta United	-	-	-
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## Atletico Mineiro	-	-	-
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## Besiktas JK	-	-	-
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## FC Bayern Munchen	-	-	-
## FC Porto	-	-	-
## FC Schalke 04	-	-	-
## Fenerbahce SK	-	-	-
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## Galatasaray SK	-	-	-
## Girona FC	-	-	-
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## Guangzhou Evergrande Taobao FC	-	-	-
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## Lokomotiv Moscow	-	-	-
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## Manchester City	-	-	-
## Manchester United	-	-	-
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## Napoli	-	-	-
## New York City FC	-	-	-
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## Olympique de Marseille	-	-	-
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## Paris Saint-Germain	-	-	-
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## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
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## Real Sociedad	-	-	-
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## Sampdoria	-	-	-
## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
## Shanghai SIPG FC	-	-	-
## SL Benfica	-	-	-
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## Sporting CP	-	-	-
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## Tottenham Hotspur	-	-	-
## TSG 1899 Hoffenheim	-	-	-
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## VfB Stuttgart	-	-	-
## VfL Wolfsburg	-	-	-
## Villarreal CF	-	-	-
## Vissel Kobe	-	-	-
## Watford	-	-	-
## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	FC Barcelona	FC Bayern Munchen	FC Porto
## Ajax	-	-	-
## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-
## AS Monaco	-	-	-
## AS Saint Etienne	-	-	-
## Atalanta	-	-	-
## Athletic Club de Bilbao	-	-	-
## Atlanta United	-	-	-
## Atletico Madrid	-	-	-
## Atletico Mineiro	-	-	-
## Basaksehir FK	-	-	-
## Bayer 04 Leverkusen	-	-	-
## Beijing Sinobo Guoan FC	-	-	-
## Besiktas JK	-	-	-
## Borussia Dortmund	-	-	-
## Borussia Monchengladbach	-	-	-
## Burnley	-	-	-
## Chelsea	-	-	-
## Cruzeiro	-	-	-
## Crystal Palace	-	-	-
## Dalian YiFang FC	-	-	-
## Deportivo Alaves	-	-	-
## Eintracht Frankfurt	-	-	-
## Everton	-	-	-
## FC Barcelona	-	-	-
## FC Bayern Munchen	-	-	-
## FC Porto	-	-	-
## FC Schalke 04	-	-	-
## Fenerbahce SK	-	-	-
## Fluminense	-	-	-
## Fulham	-	-	-
## Galatasaray SK	-	-	-
## Girona FC	-	-	-
## Gremio	-	-	-
## Guangzhou City F.C.	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-
## Hertha BSC	-	-	-
## Inter	-	-	-
## Juventus	-	-	-
## LA Galaxy	-	-	-



## Lazio	-	-	-
## Leicester City	-	-	-
## Levante UD	-	-	-
## Liverpool	-	-	-
## Lokomotiv Moscow	-	-	-
## Los Angeles FC	-	-	-
## Manchester City	-	-	-
## Manchester United	-	-	-
## Milan	-	-	-
## Montpellier HSC	-	-	-
## Napoli	-	-	-
## New York City FC	-	-	-
## OGC Nice	-	-	-
## Olympique de Marseille	-	-	-
## Olympique Lyonnais	-	-	-
## Paris Saint-Germain	-	-	-
## PFC CSKA Moscow	-	-	-
## PSV	-	-	-
## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
## Real Madrid	-	-	-
## Real Sociedad	-	-	-
## River Plate	-	-	-
## Roma	-	-	-
## Sampdoria	-	-	-
## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
## Shanghai SIPG FC	-	-	-
## SL Benfica	-	-	-
## Southampton	-	-	-
## Sporting CP	-	-	-
## Stoke City	-	-	-
## SV Werder Bremen	-	-	-
## Torino	-	-	-
## Toronto FC	-	-	-
## Tottenham Hotspur	-	-	-
## TSG 1899 Hoffenheim	-	-	-
## Valencia CF	-	-	-
## VfB Stuttgart	-	-	-
## VfL Wolfsburg	-	-	-
## Villarreal CF	-	-	-
## Vissel Kobe	-	-	-
## Watford	-	-	-
## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	FC Schalke 04	Fenerbahce	SK Fluminense
## Ajax	-	-	-
## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-

## AS Monaco	-	-	-	-
## AS Saint Etienne	-	-	-	-
## Atalanta	-	-	-	-
## Athletic Club de Bilbao	-	-	-	-
## Atlanta United	-	-	-	-
## Atletico Madrid	-	-	-	-
## Atletico Mineiro	-	-	-	-
## Basaksehir FK	-	-	-	-
## Bayer 04 Leverkusen	-	-	-	-
## Beijing Sinobo Guoan FC	-	-	-	-
## Besiktas JK	-	-	-	-
## Borussia Dortmund	-	-	-	-
## Borussia Monchengladbach	-	-	-	-
## Burnley	-	-	-	-
## Chelsea	-	-	-	-
## Cruzeiro	-	-	-	-
## Crystal Palace	-	-	-	-
## Dalian YiFang FC	-	-	-	-
## Deportivo Alaves	-	-	-	-
## Eintracht Frankfurt	-	-	-	-
## Everton	-	-	-	-
## FC Barcelona	-	-	-	-
## FC Bayern Munchen	-	-	-	-
## FC Porto	-	-	-	-
## FC Schalke 04	-	-	-	-
## Fenerbahce SK	-	-	-	-
## Fluminense	-	-	-	-
## Fulham	-	-	-	-
## Galatasaray SK	-	-	-	-
## Girona FC	-	-	-	-
## Gremio	-	-	-	-
## Guangzhou City F.C.	-	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-	-
## Hertha BSC	-	-	-	-
## Inter	-	-	-	-
## Juventus	-	-	-	-
## LA Galaxy	-	-	-	-
## Lazio	-	-	-	-
## Leicester City	-	-	-	-
## Levante UD	-	-	-	-
## Liverpool	-	-	-	-
## Lokomotiv Moscow	-	-	-	-
## Los Angeles FC	-	-	-	-
## Manchester City	-	-	-	-
## Manchester United	-	-	-	-
## Milan	-	-	-	-
## Montpellier HSC	-	-	-	-
## Napoli	-	-	-	-
## New York City FC	-	-	-	-
## OGC Nice	-	-	-	-
## Olympique de Marseille	-	-	-	-
## Olympique Lyonnais	-	-	-	-
## Paris Saint-Germain	-	-	-	-
## PFC CSKA Moscow	-	-	-	-

## PSV	-	-	-	-
## RB Leipzig	-	-	-	-
## RC Celta	-	-	-	-
## Real Betis	-	-	-	-
## Real Madrid	-	-	-	-
## Real Sociedad	-	-	-	-
## River Plate	-	-	-	-
## Roma	-	-	-	-
## Sampdoria	-	-	-	-
## Sassuolo	-	-	-	-
## SC Braga	-	-	-	-
## SD Eibar	-	-	-	-
## Sevilla FC	-	-	-	-
## Shakhtar Donetsk	-	-	-	-
## Shanghai SIPG FC	-	-	-	-
## SL Benfica	-	-	-	-
## Southampton	-	-	-	-
## Sporting CP	-	-	-	-
## Stoke City	-	-	-	-
## SV Werder Bremen	-	-	-	-
## Torino	-	-	-	-
## Toronto FC	-	-	-	-
## Tottenham Hotspur	-	-	-	-
## TSG 1899 Hoffenheim	-	-	-	-
## Valencia CF	-	-	-	-
## VfB Stuttgart	-	-	-	-
## VfL Wolfsburg	-	-	-	-
## Villarreal CF	-	-	-	-
## Vissel Kobe	-	-	-	-
## Watford	-	-	-	-
## West Ham United	-	-	-	-
## Wolverhampton Wanderers	-	-	-	-
##	Galatasaray SK	Girona FC	Gremio	
## Ajax	-	-	-	
## Al Hilal	-	-	-	
## Al Nassr	-	-	-	
## Arsenal	-	-	-	
## AS Monaco	-	-	-	
## AS Saint Etienne	-	-	-	
## Atalanta	-	-	-	
## Athletic Club de Bilbao	-	-	-	
## Atlanta United	-	-	-	
## Atletico Madrid	-	-	-	
## Atletico Mineiro	-	-	-	
## Basaksehir FK	-	-	-	
## Bayer 04 Leverkusen	-	-	-	
## Beijing Sinobo Guoan FC	-	-	-	
## Besiktas JK	-	-	-	
## Borussia Dortmund	-	-	-	
## Borussia Monchengladbach	-	-	-	
## Burnley	-	-	-	
## Chelsea	-	-	-	
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## Dalian YiFang FC	-	-	-
## Deportivo Alaves	-	-	-
## Eintracht Frankfurt	-	-	-
## Everton	-	-	-
## FC Barcelona	-	-	-
## FC Bayern Munchen	-	-	-
## FC Porto	-	-	-
## FC Schalke 04	-	-	-
## Fenerbahce SK	-	-	-
## Fluminense	-	-	-
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## Galatasaray SK	-	-	-
## Girona FC	-	-	-
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## Guangzhou City F.C.	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-
## Hertha BSC	-	-	-
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## Juventus	-	-	-
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## Lazio	-	-	-
## Leicester City	-	-	-
## Levante UD	-	-	-
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## Lokomotiv Moscow	-	-	-
## Los Angeles FC	-	-	-
## Manchester City	-	-	-
## Manchester United	-	-	-
## Milan	-	-	-
## Montpellier HSC	-	-	-
## Napoli	-	-	-
## New York City FC	-	-	-
## OGC Nice	-	-	-
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## Paris Saint-Germain	-	-	-
## PFC CSKA Moscow	-	-	-
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## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
## Real Madrid	-	-	-
## Real Sociedad	-	-	-
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## Sevilla FC	-	-	-
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## Sporting CP	-	-	-
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##	Guangzhou City F.C.		
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## Inter	-
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## New York City FC	-
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## Wolverhampton Wanderers	-
##	Guangzhou Evergrande Taobao FC Hertha BSC Inter
## Ajax	-

## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-
## AS Monaco	-	-	-
## AS Saint Etienne	-	-	-
## Atalanta	-	-	-
## Athletic Club de Bilbao	-	-	-
## Atlanta United	-	-	-
## Atletico Madrid	-	-	-
## Atletico Mineiro	-	-	-
## Basaksehir FK	-	-	-
## Bayer 04 Leverkusen	-	-	-
## Beijing Sinobo Guoan FC	-	-	-
## Besiktas JK	-	-	-
## Borussia Dortmund	-	-	-
## Borussia Monchengladbach	-	-	-
## Burnley	-	-	-
## Chelsea	-	-	-
## Cruzeiro	-	-	-
## Crystal Palace	-	-	-
## Dalian YiFang FC	-	-	-
## Deportivo Alaves	-	-	-
## Eintracht Frankfurt	-	-	-
## Everton	-	-	-
## FC Barcelona	-	-	-
## FC Bayern Munchen	-	-	-
## FC Porto	-	-	-
## FC Schalke 04	-	-	-
## Fenerbahce SK	-	-	-
## Fluminense	-	-	-
## Fulham	-	-	-
## Galatasaray SK	-	-	-
## Girona FC	-	-	-
## Gremio	-	-	-
## Guangzhou City F.C.	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-
## Hertha BSC	-	-	-
## Inter	-	-	-
## Juventus	-	-	-
## LA Galaxy	-	-	-
## Lazio	-	-	-
## Leicester City	-	-	-
## Levante UD	-	-	-
## Liverpool	-	-	-
## Lokomotiv Moscow	-	-	-
## Los Angeles FC	-	-	-
## Manchester City	-	-	-
## Manchester United	-	-	-
## Milan	-	-	-
## Montpellier HSC	-	-	-
## Napoli	-	-	-
## New York City FC	-	-	-
## OGC Nice	-	-	-
## Olympique de Marseille	-	-	-

## Olympique Lyonnais	-	-	-
## Paris Saint-Germain	-	-	-
## PFC CSKA Moscow	-	-	-
## PSV	-	-	-
## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
## Real Madrid	-	-	-
## Real Sociedad	-	-	-
## River Plate	-	-	-
## Roma	-	-	-
## Sampdoria	-	-	-
## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
## Shanghai SIPG FC	-	-	-
## SL Benfica	-	-	-
## Southampton	-	-	-
## Sporting CP	-	-	-
## Stoke City	-	-	-
## SV Werder Bremen	-	-	-
## Torino	-	-	-
## Toronto FC	-	-	-
## Tottenham Hotspur	-	-	-
## TSG 1899 Hoffenheim	-	-	-
## Valencia CF	-	-	-
## VfB Stuttgart	-	-	-
## VfL Wolfsburg	-	-	-
## Villarreal CF	-	-	-
## Vissel Kobe	-	-	-
## Watford	-	-	-
## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	Juventus	LA Galaxy	Lazio Leicester City
## Ajax	-	-	-
## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-
## AS Monaco	-	-	-
## AS Saint Etienne	-	-	-
## Atalanta	-	-	-
## Athletic Club de Bilbao	-	-	-
## Atlanta United	-	-	-
## Atletico Madrid	-	-	-
## Atletico Mineiro	-	-	-
## Basaksehir FK	-	-	-
## Bayer 04 Leverkusen	-	-	-
## Beijing Sinobo Guoan FC	-	-	-
## Besiktas JK	-	-	-
## Borussia Dortmund	-	-	-
## Borussia Monchengladbach	-	-	-
## Burnley	-	-	-



## Chelsea	-	-	-	-
## Cruzeiro	-	-	-	-
## Crystal Palace	-	-	-	-
## Dalian YiFang FC	-	-	-	-
## Deportivo Alaves	-	-	-	-
## Eintracht Frankfurt	-	-	-	-
## Everton	-	-	-	-
## FC Barcelona	-	-	-	-
## FC Bayern Munchen	-	-	-	-
## FC Porto	-	-	-	-
## FC Schalke 04	-	-	-	-
## Fenerbahce SK	-	-	-	-
## Fluminense	-	-	-	-
## Fulham	-	-	-	-
## Galatasaray SK	-	-	-	-
## Girona FC	-	-	-	-
## Gremio	-	-	-	-
## Guangzhou City F.C.	-	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-	-
## Hertha BSC	-	-	-	-
## Inter	-	-	-	-
## Juventus	-	-	-	-
## LA Galaxy	-	-	-	-
## Lazio	-	-	-	-
## Leicester City	-	-	-	-
## Levante UD	-	-	-	-
## Liverpool	-	-	-	-
## Lokomotiv Moscow	-	-	-	-
## Los Angeles FC	-	-	-	-
## Manchester City	-	-	-	-
## Manchester United	-	-	-	-
## Milan	-	-	-	-
## Montpellier HSC	-	-	-	-
## Napoli	-	-	-	-
## New York City FC	-	-	-	-
## OGC Nice	-	-	-	-
## Olympique de Marseille	-	-	-	-
## Olympique Lyonnais	-	-	-	-
## Paris Saint-Germain	-	-	-	-
## PFC CSKA Moscow	-	-	-	-
## PSV	-	-	-	-
## RB Leipzig	-	-	-	-
## RC Celta	-	-	-	-
## Real Betis	-	-	-	-
## Real Madrid	-	-	-	-
## Real Sociedad	-	-	-	-
## River Plate	-	-	-	-
## Roma	-	-	-	-
## Sampdoria	-	-	-	-
## Sassuolo	-	-	-	-
## SC Braga	-	-	-	-
## SD Eibar	-	-	-	-
## Sevilla FC	-	-	-	-
## Shakhtar Donetsk	-	-	-	-

## Shanghai SIPG FC	-	-	-	-
## SL Benfica	-	-	-	-
## Southampton	-	-	-	-
## Sporting CP	-	-	-	-
## Stoke City	-	-	-	-
## SV Werder Bremen	-	-	-	-
## Torino	-	-	-	-
## Toronto FC	-	-	-	-
## Tottenham Hotspur	-	-	-	-
## TSG 1899 Hoffenheim	-	-	-	-
## Valencia CF	-	-	-	-
## VfB Stuttgart	-	-	-	-
## VfL Wolfsburg	-	-	-	-
## Villarreal CF	-	-	-	-
## Visser Kobe	-	-	-	-
## Watford	-	-	-	-
## West Ham United	-	-	-	-
## Wolverhampton Wanderers	-	-	-	-
##	Levante UD	Liverpool	Lokomotiv Moscow	
## Ajax	-	-	-	
## Al Hilal	-	-	-	
## Al Nassr	-	-	-	
## Arsenal	-	-	-	
## AS Monaco	-	-	-	
## AS Saint Etienne	-	-	-	
## Atalanta	-	-	-	
## Athletic Club de Bilbao	-	-	-	
## Atlanta United	-	-	-	
## Atletico Madrid	-	-	-	
## Atletico Mineiro	-	-	-	
## Basaksehir FK	-	-	-	
## Bayer 04 Leverkusen	-	-	-	
## Beijing Sinobo Guoan FC	-	-	-	
## Besiktas JK	-	-	-	
## Borussia Dortmund	-	-	-	
## Borussia Monchengladbach	-	-	-	
## Burnley	-	-	-	
## Chelsea	-	-	-	
## Cruzeiro	-	-	-	
## Crystal Palace	-	-	-	
## Dalian YiFang FC	-	-	-	
## Deportivo Alaves	-	-	-	
## Eintracht Frankfurt	-	-	-	
## Everton	-	-	-	
## FC Barcelona	-	-	-	
## FC Bayern Munchen	-	-	-	
## FC Porto	-	-	-	
## FC Schalke 04	-	-	-	
## Fenerbahce SK	-	-	-	
## Fluminense	-	-	-	
## Fulham	-	-	-	
## Galatasaray SK	-	-	-	
## Girona FC	-	-	-	
## Gremio	-	-	-	

## Guangzhou City F.C.	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-
## Hertha BSC	-	-	-
## Inter	-	-	-
## Juventus	-	-	-
## LA Galaxy	-	-	-
## Lazio	-	-	-
## Leicester City	-	-	-
## Levante UD	-	-	-
## Liverpool	-	-	-
## Lokomotiv Moscow	-	-	-
## Los Angeles FC	-	-	-
## Manchester City	-	-	-
## Manchester United	-	-	-
## Milan	-	-	-
## Montpellier HSC	-	-	-
## Napoli	-	-	-
## New York City FC	-	-	-
## OGC Nice	-	-	-
## Olympique de Marseille	-	-	-
## Olympique Lyonnais	-	-	-
## Paris Saint-Germain	-	-	-
## PFC CSKA Moscow	-	-	-
## PSV	-	-	-
## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
## Real Madrid	-	-	-
## Real Sociedad	-	-	-
## River Plate	-	-	-
## Roma	-	-	-
## Sampdoria	-	-	-
## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
## Shanghai SIPG FC	-	-	-
## SL Benfica	-	-	-
## Southampton	-	-	-
## Sporting CP	-	-	-
## Stoke City	-	-	-
## SV Werder Bremen	-	-	-
## Torino	-	-	-
## Toronto FC	-	-	-
## Tottenham Hotspur	-	-	-
## TSG 1899 Hoffenheim	-	-	-
## Valencia CF	-	-	-
## VfB Stuttgart	-	-	-
## VfL Wolfsburg	-	-	-
## Villarreal CF	-	-	-
## Vissel Kobe	-	-	-
## Watford	-	-	-
## West Ham United	-	-	-

## Wolverhampton Wanderers	-	-	-
##	Los Angeles FC	Manchester City	Manchester United
## Ajax	-	-	-
## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-
## AS Monaco	-	-	-
## AS Saint Etienne	-	-	-
## Atalanta	-	-	-
## Athletic Club de Bilbao	-	-	-
## Atlanta United	-	-	-
## Atletico Madrid	-	-	-
## Atletico Mineiro	-	-	-
## Basaksehir FK	-	-	-
## Bayer 04 Leverkusen	-	-	-
## Beijing Sinobo Guoan FC	-	-	-
## Besiktas JK	-	-	-
## Borussia Dortmund	-	-	-
## Borussia Monchengladbach	-	-	-
## Burnley	-	-	-
## Chelsea	-	-	-
## Cruzeiro	-	-	-
## Crystal Palace	-	-	-
## Dalian YiFang FC	-	-	-
## Deportivo Alaves	-	-	-
## Eintracht Frankfurt	-	-	-
## Everton	-	-	-
## FC Barcelona	-	-	-
## FC Bayern Munchen	-	-	-
## FC Porto	-	-	-
## FC Schalke 04	-	-	-
## Fenerbahce SK	-	-	-
## Fluminense	-	-	-
## Fulham	-	-	-
## Galatasaray SK	-	-	-
## Girona FC	-	-	-
## Gremio	-	-	-
## Guangzhou City F.C.	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-
## Hertha BSC	-	-	-
## Inter	-	-	-
## Juventus	-	-	-
## LA Galaxy	-	-	-
## Lazio	-	-	-
## Leicester City	-	-	-
## Levante UD	-	-	-
## Liverpool	-	-	-
## Lokomotiv Moscow	-	-	-
## Los Angeles FC	-	-	-
## Manchester City	-	-	-
## Manchester United	-	-	-
## Milan	-	-	-
## Montpellier HSC	-	-	-
## Napoli	-	-	-

## New York City FC	-	-	-
## OGC Nice	-	-	-
## Olympique de Marseille	-	-	-
## Olympique Lyonnais	-	-	-
## Paris Saint-Germain	-	-	-
## PFC CSKA Moscow	-	-	-
## PSV	-	-	-
## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
## Real Madrid	-	-	-
## Real Sociedad	-	-	-
## River Plate	-	-	-
## Roma	-	-	-
## Sampdoria	-	-	-
## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
## Shanghai SIPG FC	-	-	-
## SL Benfica	-	-	-
## Southampton	-	-	-
## Sporting CP	-	-	-
## Stoke City	-	-	-
## SV Werder Bremen	-	-	-
## Torino	-	-	-
## Toronto FC	-	-	-
## Tottenham Hotspur	-	-	-
## TSG 1899 Hoffenheim	-	-	-
## Valencia CF	-	-	-
## VfB Stuttgart	-	-	-
## VfL Wolfsburg	-	-	-
## Villarreal CF	-	-	-
## Vissel Kobe	-	-	-
## Watford	-	-	-
## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	Milan	Montpellier	HSC Napoli New York City FC
## Ajax	-	-	-
## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-
## AS Monaco	-	-	-
## AS Saint Etienne	-	-	-
## Atalanta	-	-	-
## Athletic Club de Bilbao	-	-	-
## Atlanta United	-	-	-
## Atletico Madrid	-	-	-
## Atletico Mineiro	-	-	-
## Basaksehir FK	-	-	-
## Bayer 04 Leverkusen	-	-	-
## Beijing Sinobo Guoan FC	-	-	-
## Besiktas JK	-	-	-

## Borussia Dortmund	-	-	-	-
## Borussia Monchengladbach	-	-	-	-
## Burnley	-	-	-	-
## Chelsea	-	-	-	-
## Cruzeiro	-	-	-	-
## Crystal Palace	-	-	-	-
## Dalian YiFang FC	-	-	-	-
## Deportivo Alaves	-	-	-	-
## Eintracht Frankfurt	-	-	-	-
## Everton	-	-	-	-
## FC Barcelona	-	-	-	-
## FC Bayern Munchen	-	-	-	-
## FC Porto	-	-	-	-
## FC Schalke 04	-	-	-	-
## Fenerbahce SK	-	-	-	-
## Fluminense	-	-	-	-
## Fulham	-	-	-	-
## Galatasaray SK	-	-	-	-
## Girona FC	-	-	-	-
## Gremio	-	-	-	-
## Guangzhou City F.C.	-	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-	-
## Hertha BSC	-	-	-	-
## Inter	-	-	-	-
## Juventus	-	-	-	-
## LA Galaxy	-	-	-	-
## Lazio	-	-	-	-
## Leicester City	-	-	-	-
## Levante UD	-	-	-	-
## Liverpool	-	-	-	-
## Lokomotiv Moscow	-	-	-	-
## Los Angeles FC	-	-	-	-
## Manchester City	-	-	-	-
## Manchester United	-	-	-	-
## Milan	-	-	-	-
## Montpellier HSC	-	-	-	-
## Napoli	-	-	-	-
## New York City FC	-	-	-	-
## OGC Nice	-	-	-	-
## Olympique de Marseille	-	-	-	-
## Olympique Lyonnais	-	-	-	-
## Paris Saint-Germain	-	-	-	-
## PFC CSKA Moscow	-	-	-	-
## PSV	-	-	-	-
## RB Leipzig	-	-	-	-
## RC Celta	-	-	-	-
## Real Betis	-	-	-	-
## Real Madrid	-	-	-	-
## Real Sociedad	-	-	-	-
## River Plate	-	-	-	-
## Roma	-	-	-	-
## Sampdoria	-	-	-	-
## Sassuolo	-	-	-	-
## SC Braga	-	-	-	-

## SD Eibar	-	-	-	-
## Sevilla FC	-	-	-	-
## Shakhtar Donetsk	-	-	-	-
## Shanghai SIPG FC	-	-	-	-
## SL Benfica	-	-	-	-
## Southampton	-	-	-	-
## Sporting CP	-	-	-	-
## Stoke City	-	-	-	-
## SV Werder Bremen	-	-	-	-
## Torino	-	-	-	-
## Toronto FC	-	-	-	-
## Tottenham Hotspur	-	-	-	-
## TSG 1899 Hoffenheim	-	-	-	-
## Valencia CF	-	-	-	-
## VfB Stuttgart	-	-	-	-
## VfL Wolfsburg	-	-	-	-
## Villarreal CF	-	-	-	-
## Vissel Kobe	-	-	-	-
## Watford	-	-	-	-
## West Ham United	-	-	-	-
## Wolverhampton Wanderers	-	-	-	-
##	OGC Nice	Olympique de Marseille		
## Ajax	-	-		
## Al Hilal	-	-		
## Al Nassr	-	-		
## Arsenal	-	-		
## AS Monaco	-	-		
## AS Saint Etienne	-	-		
## Atalanta	-	-		
## Athletic Club de Bilbao	-	-		
## Atlanta United	-	-		
## Atletico Madrid	-	-		
## Atletico Mineiro	-	-		
## Basaksehir FK	-	-		
## Bayer 04 Leverkusen	-	-		
## Beijing Sinobo Guoan FC	-	-		
## Besiktas JK	-	-		
## Borussia Dortmund	-	-		
## Borussia Monchengladbach	-	-		
## Burnley	-	-		
## Chelsea	-	-		
## Cruzeiro	-	-		
## Crystal Palace	-	-		
## Dalian YiFang FC	-	-		
## Deportivo Alaves	-	-		
## Eintracht Frankfurt	-	-		
## Everton	-	-		
## FC Barcelona	-	-		
## FC Bayern Munchen	-	-		
## FC Porto	-	-		
## FC Schalke 04	-	-		
## Fenerbahce SK	-	-		
## Fluminense	-	-		
## Fulham	-	-		

## Galatasaray SK	-	-
## Girona FC	-	-
## Gremio	-	-
## Guangzhou City F.C.	-	-
## Guangzhou Evergrande Taobao FC	-	-
## Hertha BSC	-	-
## Inter	-	-
## Juventus	-	-
## LA Galaxy	-	-
## Lazio	-	-
## Leicester City	-	-
## Levante UD	-	-
## Liverpool	-	-
## Lokomotiv Moscow	-	-
## Los Angeles FC	-	-
## Manchester City	-	-
## Manchester United	-	-
## Milan	-	-
## Montpellier HSC	-	-
## Napoli	-	-
## New York City FC	-	-
## OGC Nice	-	-
## Olympique de Marseille	-	-
## Olympique Lyonnais	-	-
## Paris Saint-Germain	-	-
## PFC CSKA Moscow	-	-
## PSV	-	-
## RB Leipzig	-	-
## RC Celta	-	-
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## Real Madrid	-	-
## Real Sociedad	-	-
## River Plate	-	-
## Roma	-	-
## Sampdoria	-	-
## Sassuolo	-	-
## SC Braga	-	-
## SD Eibar	-	-
## Sevilla FC	-	-
## Shakhtar Donetsk	-	-
## Shanghai SIPG FC	-	-
## SL Benfica	-	-
## Southampton	-	-
## Sporting CP	-	-
## Stoke City	-	-
## SV Werder Bremen	-	-
## Torino	-	-
## Toronto FC	-	-
## Tottenham Hotspur	-	-
## TSG 1899 Hoffenheim	-	-
## Valencia CF	-	-
## VfB Stuttgart	-	-
## VfL Wolfsburg	-	-
## Villarreal CF	-	-



## Vissel Kobe	-	-
## Watford	-	-
## West Ham United	-	-
## Wolverhampton Wanderers	-	-
##	Olympique Lyonnais	Paris Saint-Germain
## Ajax	-	-
## Al Hilal	-	-
## Al Nassr	-	-
## Arsenal	-	-
## AS Monaco	-	-
## AS Saint Etienne	-	-
## Atalanta	-	-
## Athletic Club de Bilbao	-	-
## Atlanta United	-	-
## Atletico Madrid	-	-
## Atletico Mineiro	-	-
## Basaksehir FK	-	-
## Bayer 04 Leverkusen	-	-
## Beijing Sinobo Guoan FC	-	-
## Besiktas JK	-	-
## Borussia Dortmund	-	-
## Borussia Monchengladbach	-	-
## Burnley	-	-
## Chelsea	-	-
## Cruzeiro	-	-
## Crystal Palace	-	-
## Dalian YiFang FC	-	-
## Deportivo Alaves	-	-
## Eintracht Frankfurt	-	-
## Everton	-	-
## FC Barcelona	-	-
## FC Bayern Munchen	-	-
## FC Porto	-	-
## FC Schalke 04	-	-
## Fenerbahce SK	-	-
## Fluminense	-	-
## Fulham	-	-
## Galatasaray SK	-	-
## Girona FC	-	-
## Gremio	-	-
## Guangzhou City F.C.	-	-
## Guangzhou Evergrande Taobao FC	-	-
## Hertha BSC	-	-
## Inter	-	-
## Juventus	-	-
## LA Galaxy	-	-
## Lazio	-	-
## Leicester City	-	-
## Levante UD	-	-
## Liverpool	-	-
## Lokomotiv Moscow	-	-
## Los Angeles FC	-	-
## Manchester City	-	-
## Manchester United	-	-

## Milan	-	-
## Montpellier HSC	-	-
## Napoli	-	-
## New York City FC	-	-
## OGC Nice	-	-
## Olympique de Marseille	-	-
## Olympique Lyonnais	-	-
## Paris Saint-Germain	-	-
## PFC CSKA Moscow	-	-
## PSV	-	-
## RB Leipzig	-	-
## RC Celta	-	-
## Real Betis	-	-
## Real Madrid	-	-
## Real Sociedad	-	-
## River Plate	-	-
## Roma	-	-
## Sampdoria	-	-
## Sassuolo	-	-
## SC Braga	-	-
## SD Eibar	-	-
## Sevilla FC	-	-
## Shakhtar Donetsk	-	-
## Shanghai SIPG FC	-	-
## SL Benfica	-	-
## Southampton	-	-
## Sporting CP	-	-
## Stoke City	-	-
## SV Werder Bremen	-	-
## Torino	-	-
## Toronto FC	-	-
## Tottenham Hotspur	-	-
## TSG 1899 Hoffenheim	-	-
## Valencia CF	-	-
## VfB Stuttgart	-	-
## VfL Wolfsburg	-	-
## Villarreal CF	-	-
## Vissel Kobe	-	-
## Watford	-	-
## West Ham United	-	-
## Wolverhampton Wanderers	-	-
##	PFC CSKA Moscow	PSV RB Leipzig RC Celta
## Ajax	-	- - -
## Al Hilal	-	- - -
## Al Nassr	-	- - -
## Arsenal	-	- - -
## AS Monaco	-	- - -
## AS Saint Etienne	-	- - -
## Atalanta	-	- - -
## Athletic Club de Bilbao	-	- - -
## Atlanta United	-	- - -
## Atletico Madrid	-	- - -
## Atletico Mineiro	-	- - -
## Basaksehir FK	-	- - -

## Bayer 04 Leverkusen	-	-	-	-
## Beijing Sinobo Guoan FC	-	-	-	-
## Besiktas JK	-	-	-	-
## Borussia Dortmund	-	-	-	-
## Borussia Monchengladbach	-	-	-	-
## Burnley	-	-	-	-
## Chelsea	-	-	-	-
## Cruzeiro	-	-	-	-
## Crystal Palace	-	-	-	-
## Dalian YiFang FC	-	-	-	-
## Deportivo Alaves	-	-	-	-
## Eintracht Frankfurt	-	-	-	-
## Everton	-	-	-	-
## FC Barcelona	-	-	-	-
## FC Bayern Munchen	-	-	-	-
## FC Porto	-	-	-	-
## FC Schalke 04	-	-	-	-
## Fenerbahce SK	-	-	-	-
## Fluminense	-	-	-	-
## Fulham	-	-	-	-
## Galatasaray SK	-	-	-	-
## Girona FC	-	-	-	-
## Gremio	-	-	-	-
## Guangzhou City F.C.	-	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-	-
## Hertha BSC	-	-	-	-
## Inter	-	-	-	-
## Juventus	-	-	-	-
## LA Galaxy	-	-	-	-
## Lazio	-	-	-	-
## Leicester City	-	-	-	-
## Levante UD	-	-	-	-
## Liverpool	-	-	-	-
## Lokomotiv Moscow	-	-	-	-
## Los Angeles FC	-	-	-	-
## Manchester City	-	-	-	-
## Manchester United	-	-	-	-
## Milan	-	-	-	-
## Montpellier HSC	-	-	-	-
## Napoli	-	-	-	-
## New York City FC	-	-	-	-
## OGC Nice	-	-	-	-
## Olympique de Marseille	-	-	-	-
## Olympique Lyonnais	-	-	-	-
## Paris Saint-Germain	-	-	-	-
## PFC CSKA Moscow	-	-	-	-
## PSV	-	-	-	-
## RB Leipzig	-	-	-	-
## RC Celta	-	-	-	-
## Real Betis	-	-	-	-
## Real Madrid	-	-	-	-
## Real Sociedad	-	-	-	-
## River Plate	-	-	-	-
## Roma	-	-	-	-

## Sampdoria	-	-	-	-
## Sassuolo	-	-	-	-
## SC Braga	-	-	-	-
## SD Eibar	-	-	-	-
## Sevilla FC	-	-	-	-
## Shakhtar Donetsk	-	-	-	-
## Shanghai SIPG FC	-	-	-	-
## SL Benfica	-	-	-	-
## Southampton	-	-	-	-
## Sporting CP	-	-	-	-
## Stoke City	-	-	-	-
## SV Werder Bremen	-	-	-	-
## Torino	-	-	-	-
## Toronto FC	-	-	-	-
## Tottenham Hotspur	-	-	-	-
## TSG 1899 Hoffenheim	-	-	-	-
## Valencia CF	-	-	-	-
## VfB Stuttgart	-	-	-	-
## VfL Wolfsburg	-	-	-	-
## Villarreal CF	-	-	-	-
## Vissel Kobe	-	-	-	-
## Watford	-	-	-	-
## West Ham United	-	-	-	-
## Wolverhampton Wanderers	-	-	-	-
##	Real Betis	Real Madrid	Real Sociedad	River Plate
## Ajax	-	-	-	-
## Al Hilal	-	-	-	-
## Al Nassr	-	-	-	-
## Arsenal	-	-	-	-
## AS Monaco	-	-	-	-
## AS Saint Etienne	-	-	-	-
## Atalanta	-	-	-	-
## Athletic Club de Bilbao	-	-	-	-
## Atlanta United	-	-	-	-
## Atletico Madrid	-	-	-	-
## Atletico Mineiro	-	-	-	-
## Basaksehir FK	-	-	-	-
## Bayer 04 Leverkusen	-	-	-	-
## Beijing Sinobo Guoan FC	-	-	-	-
## Besiktas JK	-	-	-	-
## Borussia Dortmund	-	-	-	-
## Borussia Monchengladbach	-	-	-	-
## Burnley	-	-	-	-
## Chelsea	-	-	-	-
## Cruzeiro	-	-	-	-
## Crystal Palace	-	-	-	-
## Dalian YiFang FC	-	-	-	-
## Deportivo Alaves	-	-	-	-
## Eintracht Frankfurt	-	-	-	-
## Everton	-	-	-	-
## FC Barcelona	-	-	-	-
## FC Bayern Munchen	-	-	-	-
## FC Porto	-	-	-	-
## FC Schalke 04	-	-	-	-

## Fenerbahce SK	-	-	-	-
## Fluminense	-	-	-	-
## Fulham	-	-	-	-
## Galatasaray SK	-	-	-	-
## Girona FC	-	-	-	-
## Gremio	-	-	-	-
## Guangzhou City F.C.	-	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-	-
## Hertha BSC	-	-	-	-
## Inter	-	-	-	-
## Juventus	-	-	-	-
## LA Galaxy	-	-	-	-
## Lazio	-	-	-	-
## Leicester City	-	-	-	-
## Levante UD	-	-	-	-
## Liverpool	-	-	-	-
## Lokomotiv Moscow	-	-	-	-
## Los Angeles FC	-	-	-	-
## Manchester City	-	-	-	-
## Manchester United	-	-	-	-
## Milan	-	-	-	-
## Montpellier HSC	-	-	-	-
## Napoli	-	-	-	-
## New York City FC	-	-	-	-
## OGC Nice	-	-	-	-
## Olympique de Marseille	-	-	-	-
## Olympique Lyonnais	-	-	-	-
## Paris Saint-Germain	-	-	-	-
## PFC CSKA Moscow	-	-	-	-
## PSV	-	-	-	-
## RB Leipzig	-	-	-	-
## RC Celta	-	-	-	-
## Real Betis	-	-	-	-
## Real Madrid	-	-	-	-
## Real Sociedad	-	-	-	-
## River Plate	-	-	-	-
## Roma	-	-	-	-
## Sampdoria	-	-	-	-
## Sassuolo	-	-	-	-
## SC Braga	-	-	-	-
## SD Eibar	-	-	-	-
## Sevilla FC	-	-	-	-
## Shakhtar Donetsk	-	-	-	-
## Shanghai SIPG FC	-	-	-	-
## SL Benfica	-	-	-	-
## Southampton	-	-	-	-
## Sporting CP	-	-	-	-
## Stoke City	-	-	-	-
## SV Werder Bremen	-	-	-	-
## Torino	-	-	-	-
## Toronto FC	-	-	-	-
## Tottenham Hotspur	-	-	-	-
## TSG 1899 Hoffenheim	-	-	-	-
## Valencia CF	-	-	-	-

## VfB Stuttgart	-	-	-	-
## VfL Wolfsburg	-	-	-	-
## Villarreal CF	-	-	-	-
## Visser Kobe	-	-	-	-
## Watford	-	-	-	-
## West Ham United	-	-	-	-
## Wolverhampton Wanderers	-	-	-	-
##	Roma	Sampdoria	Sassuolo	SC Braga SD Eibar
## Ajax	-	-	-	-
## Al Hilal	-	-	-	-
## Al Nassr	-	-	-	-
## Arsenal	-	-	-	-
## AS Monaco	-	-	-	-
## AS Saint Etienne	-	-	-	-
## Atalanta	-	-	-	-
## Athletic Club de Bilbao	-	-	-	-
## Atlanta United	-	-	-	-
## Atletico Madrid	-	-	-	-
## Atletico Mineiro	-	-	-	-
## Basaksehir FK	-	-	-	-
## Bayer 04 Leverkusen	-	-	-	-
## Beijing Sinobo Guoan FC	-	-	-	-
## Besiktas JK	-	-	-	-
## Borussia Dortmund	-	-	-	-
## Borussia Monchengladbach	-	-	-	-
## Burnley	-	-	-	-
## Chelsea	-	-	-	-
## Cruzeiro	-	-	-	-
## Crystal Palace	-	-	-	-
## Dalian YiFang FC	-	-	-	-
## Deportivo Alaves	-	-	-	-
## Eintracht Frankfurt	-	-	-	-
## Everton	-	-	-	-
## FC Barcelona	-	-	-	-
## FC Bayern Munchen	-	-	-	-
## FC Porto	-	-	-	-
## FC Schalke 04	-	-	-	-
## Fenerbahce SK	-	-	-	-
## Fluminense	-	-	-	-
## Fulham	-	-	-	-
## Galatasaray SK	-	-	-	-
## Girona FC	-	-	-	-
## Gremio	-	-	-	-
## Guangzhou City F.C.	-	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-	-
## Hertha BSC	-	-	-	-
## Inter	-	-	-	-
## Juventus	-	-	-	-
## LA Galaxy	-	-	-	-
## Lazio	-	-	-	-
## Leicester City	-	-	-	-
## Levante UD	-	-	-	-
## Liverpool	-	-	-	-
## Lokomotiv Moscow	-	-	-	-

## Los Angeles FC	-	-	-	-	-
## Manchester City	-	-	-	-	-
## Manchester United	-	-	-	-	-
## Milan	-	-	-	-	-
## Montpellier HSC	-	-	-	-	-
## Napoli	-	-	-	-	-
## New York City FC	-	-	-	-	-
## OGC Nice	-	-	-	-	-
## Olympique de Marseille	-	-	-	-	-
## Olympique Lyonnais	-	-	-	-	-
## Paris Saint-Germain	-	-	-	-	-
## PFC CSKA Moscow	-	-	-	-	-
## PSV	-	-	-	-	-
## RB Leipzig	-	-	-	-	-
## RC Celta	-	-	-	-	-
## Real Betis	-	-	-	-	-
## Real Madrid	-	-	-	-	-
## Real Sociedad	-	-	-	-	-
## River Plate	-	-	-	-	-
## Roma	-	-	-	-	-
## Sampdoria	-	-	-	-	-
## Sassuolo	-	-	-	-	-
## SC Braga	-	-	-	-	-
## SD Eibar	-	-	-	-	-
## Sevilla FC	-	-	-	-	-
## Shakhtar Donetsk	-	-	-	-	-
## Shanghai SIPG FC	-	-	-	-	-
## SL Benfica	-	-	-	-	-
## Southampton	-	-	-	-	-
## Sporting CP	-	-	-	-	-
## Stoke City	-	-	-	-	-
## SV Werder Bremen	-	-	-	-	-
## Torino	-	-	-	-	-
## Toronto FC	-	-	-	-	-
## Tottenham Hotspur	-	-	-	-	-
## TSG 1899 Hoffenheim	-	-	-	-	-
## Valencia CF	-	-	-	-	-
## VfB Stuttgart	-	-	-	-	-
## VfL Wolfsburg	-	-	-	-	-
## Villarreal CF	-	-	-	-	-
## Vissel Kobe	-	-	-	-	-
## Watford	-	-	-	-	-
## West Ham United	-	-	-	-	-
## Wolverhampton Wanderers	-	-	-	-	-
##	Sevilla FC Shakhtar Donetsk Shanghai SIPG FC				
## Ajax	-	-	-	-	-
## Al Hilal	-	-	-	-	-
## Al Nassr	-	-	-	-	-
## Arsenal	-	-	-	-	-
## AS Monaco	-	-	-	-	-
## AS Saint Etienne	-	-	-	-	-
## Atalanta	-	-	-	-	-
## Athletic Club de Bilbao	-	-	-	-	-
## Atlanta United	-	-	-	-	-

## Atletico Madrid	-	-	-
## Atletico Mineiro	-	-	-
## Basaksehir FK	-	-	-
## Bayer 04 Leverkusen	-	-	-
## Beijing Sinobo Guoan FC	-	-	-
## Besiktas JK	-	-	-
## Borussia Dortmund	-	-	-
## Borussia Monchengladbach	-	-	-
## Burnley	-	-	-
## Chelsea	-	-	-
## Cruzeiro	-	-	-
## Crystal Palace	-	-	-
## Dalian YiFang FC	-	-	-
## Deportivo Alaves	-	-	-
## Eintracht Frankfurt	-	-	-
## Everton	-	-	-
## FC Barcelona	-	-	-
## FC Bayern Munchen	-	-	-
## FC Porto	-	-	-
## FC Schalke 04	-	-	-
## Fenerbahce SK	-	-	-
## Fluminense	-	-	-
## Fulham	-	-	-
## Galatasaray SK	-	-	-
## Girona FC	-	-	-
## Gremio	-	-	-
## Guangzhou City F.C.	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-
## Hertha BSC	-	-	-
## Inter	-	-	-
## Juventus	-	-	-
## LA Galaxy	-	-	-
## Lazio	-	-	-
## Leicester City	-	-	-
## Levante UD	-	-	-
## Liverpool	-	-	-
## Lokomotiv Moscow	-	-	-
## Los Angeles FC	-	-	-
## Manchester City	-	-	-
## Manchester United	-	-	-
## Milan	-	-	-
## Montpellier HSC	-	-	-
## Napoli	-	-	-
## New York City FC	-	-	-
## OGC Nice	-	-	-
## Olympique de Marseille	-	-	-
## Olympique Lyonnais	-	-	-
## Paris Saint-Germain	-	-	-
## PFC CSKA Moscow	-	-	-
## PSV	-	-	-
## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
## Real Madrid	-	-	-



## Real Sociedad	-	-	-
## River Plate	-	-	-
## Roma	-	-	-
## Sampdoria	-	-	-
## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
## Shanghai SIPG FC	-	-	-
## SL Benfica	-	-	-
## Southampton	-	-	-
## Sporting CP	-	-	-
## Stoke City	-	-	-
## SV Werder Bremen	-	-	-
## Torino	-	-	-
## Toronto FC	-	-	-
## Tottenham Hotspur	-	-	-
## TSG 1899 Hoffenheim	-	-	-
## Valencia CF	-	-	-
## VfB Stuttgart	-	-	-
## VfL Wolfsburg	-	-	-
## Villarreal CF	-	-	-
## Vissel Kobe	-	-	-
## Watford	-	-	-
## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	SL Benfica	Southampton	Sporting CP Stoke City
## Ajax	-	-	-
## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-
## AS Monaco	-	-	-
## AS Saint Etienne	-	-	-
## Atalanta	-	-	-
## Athletic Club de Bilbao	-	-	-
## Atlanta United	-	-	-
## Atletico Madrid	-	-	-
## Atletico Mineiro	-	-	-
## Basaksehir FK	-	-	-
## Bayer 04 Leverkusen	-	-	-
## Beijing Sinobo Guoan FC	-	-	-
## Besiktas JK	-	-	-
## Borussia Dortmund	-	-	-
## Borussia Monchengladbach	-	-	-
## Burnley	-	-	-
## Chelsea	-	-	-
## Cruzeiro	-	-	-
## Crystal Palace	-	-	-
## Dalian YiFang FC	-	-	-
## Deportivo Alaves	-	-	-
## Eintracht Frankfurt	-	-	-
## Everton	-	-	-
## FC Barcelona	-	-	-

## FC Bayern Munchen	-	-	-	-
## FC Porto	-	-	-	-
## FC Schalke 04	-	-	-	-
## Fenerbahce SK	-	-	-	-
## Fluminense	-	-	-	-
## Fulham	-	-	-	-
## Galatasaray SK	-	-	-	-
## Girona FC	-	-	-	-
## Gremio	-	-	-	-
## Guangzhou City F.C.	-	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-	-
## Hertha BSC	-	-	-	-
## Inter	-	-	-	-
## Juventus	-	-	-	-
## LA Galaxy	-	-	-	-
## Lazio	-	-	-	-
## Leicester City	-	-	-	-
## Levante UD	-	-	-	-
## Liverpool	-	-	-	-
## Lokomotiv Moscow	-	-	-	-
## Los Angeles FC	-	-	-	-
## Manchester City	-	-	-	-
## Manchester United	-	-	-	-
## Milan	-	-	-	-
## Montpellier HSC	-	-	-	-
## Napoli	-	-	-	-
## New York City FC	-	-	-	-
## OGC Nice	-	-	-	-
## Olympique de Marseille	-	-	-	-
## Olympique Lyonnais	-	-	-	-
## Paris Saint-Germain	-	-	-	-
## PFC CSKA Moscow	-	-	-	-
## PSV	-	-	-	-
## RB Leipzig	-	-	-	-
## RC Celta	-	-	-	-
## Real Betis	-	-	-	-
## Real Madrid	-	-	-	-
## Real Sociedad	-	-	-	-
## River Plate	-	-	-	-
## Roma	-	-	-	-
## Sampdoria	-	-	-	-
## Sassuolo	-	-	-	-
## SC Braga	-	-	-	-
## SD Eibar	-	-	-	-
## Sevilla FC	-	-	-	-
## Shakhtar Donetsk	-	-	-	-
## Shanghai SIPG FC	-	-	-	-
## SL Benfica	-	-	-	-
## Southampton	-	-	-	-
## Sporting CP	-	-	-	-
## Stoke City	-	-	-	-
## SV Werder Bremen	-	-	-	-
## Torino	-	-	-	-
## Toronto FC	-	-	-	-

## Tottenham Hotspur	-	-	-	-
## TSG 1899 Hoffenheim	-	-	-	-
## Valencia CF	-	-	-	-
## VfB Stuttgart	-	-	-	-
## VfL Wolfsburg	-	-	-	-
## Villarreal CF	-	-	-	-
## Vissel Kobe	-	-	-	-
## Watford	-	-	-	-
## West Ham United	-	-	-	-
## Wolverhampton Wanderers	-	-	-	-
##	SV Werder Bremen	Torino	Toronto FC	
## Ajax	-	-	-	
## Al Hilal	-	-	-	
## Al Nassr	-	-	-	
## Arsenal	-	-	-	
## AS Monaco	-	-	-	
## AS Saint Etienne	-	-	-	
## Atalanta	-	-	-	
## Athletic Club de Bilbao	-	-	-	
## Atlanta United	-	-	-	
## Atletico Madrid	-	-	-	
## Atletico Mineiro	-	-	-	
## Basaksehir FK	-	-	-	
## Bayer 04 Leverkusen	-	-	-	
## Beijing Sinobo Guoan FC	-	-	-	
## Besiktas JK	-	-	-	
## Borussia Dortmund	-	-	-	
## Borussia Monchengladbach	-	-	-	
## Burnley	-	-	-	
## Chelsea	-	-	-	
## Cruzeiro	-	-	-	
## Crystal Palace	-	-	-	
## Dalian YiFang FC	-	-	-	
## Deportivo Alaves	-	-	-	
## Eintracht Frankfurt	-	-	-	
## Everton	-	-	-	
## FC Barcelona	-	-	-	
## FC Bayern Munchen	-	-	-	
## FC Porto	-	-	-	
## FC Schalke 04	-	-	-	
## Fenerbahce SK	-	-	-	
## Fluminense	-	-	-	
## Fulham	-	-	-	
## Galatasaray SK	-	-	-	
## Girona FC	-	-	-	
## Gremio	-	-	-	
## Guangzhou City F.C.	-	-	-	
## Guangzhou Evergrande Taobao FC	-	-	-	
## Hertha BSC	-	-	-	
## Inter	-	-	-	
## Juventus	-	-	-	
## LA Galaxy	-	-	-	
## Lazio	-	-	-	
## Leicester City	-	-	-	

## Levante UD	-	-	-
## Liverpool	-	-	-
## Lokomotiv Moscow	-	-	-
## Los Angeles FC	-	-	-
## Manchester City	-	-	-
## Manchester United	-	-	-
## Milan	-	-	-
## Montpellier HSC	-	-	-
## Napoli	-	-	-
## New York City FC	-	-	-
## OGC Nice	-	-	-
## Olympique de Marseille	-	-	-
## Olympique Lyonnais	-	-	-
## Paris Saint-Germain	-	-	-
## PFC CSKA Moscow	-	-	-
## PSV	-	-	-
## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
## Real Madrid	-	-	-
## Real Sociedad	-	-	-
## River Plate	-	-	-
## Roma	-	-	-
## Sampdoria	-	-	-
## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
## Shanghai SIPG FC	-	-	-
## SL Benfica	-	-	-
## Southampton	-	-	-
## Sporting CP	-	-	-
## Stoke City	-	-	-
## SV Werder Bremen	-	-	-
## Torino	-	-	-
## Toronto FC	-	-	-
## Tottenham Hotspur	-	-	-
## TSG 1899 Hoffenheim	-	-	-
## Valencia CF	-	-	-
## VfB Stuttgart	-	-	-
## VfL Wolfsburg	-	-	-
## Villarreal CF	-	-	-
## Vissel Kobe	-	-	-
## Watford	-	-	-
## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	Tottenham Hotspur	TSG 1899 Hoffenheim	
## Ajax	-	-	
## Al Hilal	-	-	
## Al Nassr	-	-	
## Arsenal	-	-	
## AS Monaco	-	-	
## AS Saint Etienne	-	-	

## Atalanta	-	-
## Athletic Club de Bilbao	-	-
## Atlanta United	-	-
## Atletico Madrid	-	-
## Atletico Mineiro	-	-
## Basaksehir FK	-	-
## Bayer 04 Leverkusen	-	-
## Beijing Sinobo Guoan FC	-	-
## Besiktas JK	-	-
## Borussia Dortmund	-	-
## Borussia Monchengladbach	-	-
## Burnley	-	-
## Chelsea	-	-
## Cruzeiro	-	-
## Crystal Palace	-	-
## Dalian YiFang FC	-	-
## Deportivo Alaves	-	-
## Eintracht Frankfurt	-	-
## Everton	-	-
## FC Barcelona	-	-
## FC Bayern Munchen	-	-
## FC Porto	-	-
## FC Schalke 04	-	-
## Fenerbahce SK	-	-
## Fluminense	-	-
## Fulham	-	-
## Galatasaray SK	-	-
## Girona FC	-	-
## Gremio	-	-
## Guangzhou City F.C.	-	-
## Guangzhou Evergrande Taobao FC	-	-
## Hertha BSC	-	-
## Inter	-	-
## Juventus	-	-
## LA Galaxy	-	-
## Lazio	-	-
## Leicester City	-	-
## Levante UD	-	-
## Liverpool	-	-
## Lokomotiv Moscow	-	-
## Los Angeles FC	-	-
## Manchester City	-	-
## Manchester United	-	-
## Milan	-	-
## Montpellier HSC	-	-
## Napoli	-	-
## New York City FC	-	-
## OGC Nice	-	-
## Olympique de Marseille	-	-
## Olympique Lyonnais	-	-
## Paris Saint-Germain	-	-
## PFC CSKA Moscow	-	-
## PSV	-	-
## RB Leipzig	-	-

## RC Celta	-	-
## Real Betis	-	-
## Real Madrid	-	-
## Real Sociedad	-	-
## River Plate	-	-
## Roma	-	-
## Sampdoria	-	-
## Sassuolo	-	-
## SC Braga	-	-
## SD Eibar	-	-
## Sevilla FC	-	-
## Shakhtar Donetsk	-	-
## Shanghai SIPG FC	-	-
## SL Benfica	-	-
## Southampton	-	-
## Sporting CP	-	-
## Stoke City	-	-
## SV Werder Bremen	-	-
## Torino	-	-
## Toronto FC	-	-
## Tottenham Hotspur	-	-
## TSG 1899 Hoffenheim	-	-
## Valencia CF	-	-
## VfB Stuttgart	-	-
## VfL Wolfsburg	-	-
## Villarreal CF	-	-
## Vissel Kobe	-	-
## Watford	-	-
## West Ham United	-	-
## Wolverhampton Wanderers	-	-
##	Valencia CF	VfB Stuttgart VfL Wolfsburg
## Ajax	-	-
## Al Hilal	-	-
## Al Nassr	-	-
## Arsenal	-	-
## AS Monaco	-	-
## AS Saint Etienne	-	-
## Atalanta	-	-
## Athletic Club de Bilbao	-	-
## Atlanta United	-	-
## Atletico Madrid	-	-
## Atletico Mineiro	-	-
## Basaksehir FK	-	-
## Bayer 04 Leverkusen	-	-
## Beijing Sinobo Guoan FC	-	-
## Besiktas JK	-	-
## Borussia Dortmund	-	-
## Borussia Monchengladbach	-	-
## Burnley	-	-
## Chelsea	-	-
## Cruzeiro	-	-
## Crystal Palace	-	-
## Dalian YiFang FC	-	-
## Deportivo Alaves	-	-

## Eintracht Frankfurt	-	-	-
## Everton	-	-	-
## FC Barcelona	-	-	-
## FC Bayern Munchen	-	-	-
## FC Porto	-	-	-
## FC Schalke 04	-	-	-
## Fenerbahce SK	-	-	-
## Fluminense	-	-	-
## Fulham	-	-	-
## Galatasaray SK	-	-	-
## Girona FC	-	-	-
## Gremio	-	-	-
## Guangzhou City F.C.	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-
## Hertha BSC	-	-	-
## Inter	-	-	-
## Juventus	-	-	-
## LA Galaxy	-	-	-
## Lazio	-	-	-
## Leicester City	-	-	-
## Levante UD	-	-	-
## Liverpool	-	-	-
## Lokomotiv Moscow	-	-	-
## Los Angeles FC	-	-	-
## Manchester City	-	-	-
## Manchester United	-	-	-
## Milan	-	-	-
## Montpellier HSC	-	-	-
## Napoli	-	-	-
## New York City FC	-	-	-
## OGC Nice	-	-	-
## Olympique de Marseille	-	-	-
## Olympique Lyonnais	-	-	-
## Paris Saint-Germain	-	-	-
## PFC CSKA Moscow	-	-	-
## PSV	-	-	-
## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
## Real Madrid	-	-	-
## Real Sociedad	-	-	-
## River Plate	-	-	-
## Roma	-	-	-
## Sampdoria	-	-	-
## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
## Shanghai SIPG FC	-	-	-
## SL Benfica	-	-	-
## Southampton	-	-	-
## Sporting CP	-	-	-
## Stoke City	-	-	-

## SV Werder Bremen	-	-	-
## Torino	-	-	-
## Toronto FC	-	-	-
## Tottenham Hotspur	-	-	-
## TSG 1899 Hoffenheim	-	-	-
## Valencia CF	-	-	-
## VfB Stuttgart	-	-	-
## VfL Wolfsburg	-	-	-
## Villarreal CF	-	-	-
## Vissel Kobe	-	-	-
## Watford	-	-	-
## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	Villarreal CF	Vissel Kobe	Watford
## Ajax	-	-	-
## Al Hilal	-	-	-
## Al Nassr	-	-	-
## Arsenal	-	-	-
## AS Monaco	-	-	-
## AS Saint Etienne	-	-	-
## Atalanta	-	-	-
## Athletic Club de Bilbao	-	-	-
## Atlanta United	-	-	-
## Atletico Madrid	-	-	-
## Atletico Mineiro	-	-	-
## Basaksehir FK	-	-	-
## Bayer 04 Leverkusen	-	-	-
## Beijing Sinobo Guoan FC	-	-	-
## Besiktas JK	-	-	-
## Borussia Dortmund	-	-	-
## Borussia Monchengladbach	-	-	-
## Burnley	-	-	-
## Chelsea	-	-	-
## Cruzeiro	-	-	-
## Crystal Palace	-	-	-
## Dalian YiFang FC	-	-	-
## Deportivo Alaves	-	-	-
## Eintracht Frankfurt	-	-	-
## Everton	-	-	-
## FC Barcelona	-	-	-
## FC Bayern Munchen	-	-	-
## FC Porto	-	-	-
## FC Schalke 04	-	-	-
## Fenerbahce SK	-	-	-
## Fluminense	-	-	-
## Fulham	-	-	-
## Galatasaray SK	-	-	-
## Girona FC	-	-	-
## Gremio	-	-	-
## Guangzhou City F.C.	-	-	-
## Guangzhou Evergrande Taobao FC	-	-	-
## Hertha BSC	-	-	-
## Inter	-	-	-
## Juventus	-	-	-



## LA Galaxy	-	-	-
## Lazio	-	-	-
## Leicester City	-	-	-
## Levante UD	-	-	-
## Liverpool	-	-	-
## Lokomotiv Moscow	-	-	-
## Los Angeles FC	-	-	-
## Manchester City	-	-	-
## Manchester United	-	-	-
## Milan	-	-	-
## Montpellier HSC	-	-	-
## Napoli	-	-	-
## New York City FC	-	-	-
## OGC Nice	-	-	-
## Olympique de Marseille	-	-	-
## Olympique Lyonnais	-	-	-
## Paris Saint-Germain	-	-	-
## PFC CSKA Moscow	-	-	-
## PSV	-	-	-
## RB Leipzig	-	-	-
## RC Celta	-	-	-
## Real Betis	-	-	-
## Real Madrid	-	-	-
## Real Sociedad	-	-	-
## River Plate	-	-	-
## Roma	-	-	-
## Sampdoria	-	-	-
## Sassuolo	-	-	-
## SC Braga	-	-	-
## SD Eibar	-	-	-
## Sevilla FC	-	-	-
## Shakhtar Donetsk	-	-	-
## Shanghai SIPG FC	-	-	-
## SL Benfica	-	-	-
## Southampton	-	-	-
## Sporting CP	-	-	-
## Stoke City	-	-	-
## SV Werder Bremen	-	-	-
## Torino	-	-	-
## Toronto FC	-	-	-
## Tottenham Hotspur	-	-	-
## TSG 1899 Hoffenheim	-	-	-
## Valencia CF	-	-	-
## VfB Stuttgart	-	-	-
## VfL Wolfsburg	-	-	-
## Villarreal CF	-	-	-
## Vissel Kobe	-	-	-
## Watford	-	-	-
## West Ham United	-	-	-
## Wolverhampton Wanderers	-	-	-
##	West Ham United		
## Ajax	-		
## Al Hilal	-		
## Al Nassr	-		

## Arsenal	-
## AS Monaco	-
## AS Saint Etienne	-
## Atalanta	-
## Athletic Club de Bilbao	-
## Atlanta United	-
## Atletico Madrid	-
## Atletico Mineiro	-
## Basaksehir FK	-
## Bayer 04 Leverkusen	-
## Beijing Sinobo Guoan FC	-
## Besiktas JK	-
## Borussia Dortmund	-
## Borussia Monchengladbach	-
## Burnley	-
## Chelsea	-
## Cruzeiro	-
## Crystal Palace	-
## Dalian YiFang FC	-
## Deportivo Alaves	-
## Eintracht Frankfurt	-
## Everton	-
## FC Barcelona	-
## FC Bayern Munchen	-
## FC Porto	-
## FC Schalke 04	-
## Fenerbahce SK	-
## Fluminense	-
## Fulham	-
## Galatasaray SK	-
## Girona FC	-
## Gremio	-
## Guangzhou City F.C.	-
## Guangzhou Evergrande Taobao FC	-
## Hertha BSC	-
## Inter	-
## Juventus	-
## LA Galaxy	-
## Lazio	-
## Leicester City	-
## Levante UD	-
## Liverpool	-
## Lokomotiv Moscow	-
## Los Angeles FC	-
## Manchester City	-
## Manchester United	-
## Milan	-
## Montpellier HSC	-
## Napoli	-
## New York City FC	-
## OGC Nice	-
## Olympique de Marseille	-
## Olympique Lyonnais	-
## Paris Saint-Germain	-

```

## PFC CSKA Moscow -
## PSV -
## RB Leipzig -
## RC Celta -
## Real Betis -
## Real Madrid -
## Real Sociedad -
## River Plate -
## Roma -
## Sampdoria -
## Sassuolo -
## SC Braga -
## SD Eibar -
## Sevilla FC -
## Shakhtar Donetsk -
## Shanghai SIPG FC -
## SL Benfica -
## Southampton -
## Sporting CP -
## Stoke City -
## SV Werder Bremen -
## Torino -
## Toronto FC -
## Tottenham Hotspur -
## TSG 1899 Hoffenheim -
## Valencia CF -
## VfB Stuttgart -
## VfL Wolfsburg -
## Villarreal CF -
## Vissel Kobe -
## Watford -
## West Ham United -
## Wolverhampton Wanderers -
##
## P value adjustment method: bonferroni

```

```

# tukeys pair wise t-test
tukey_result <- TukeyHSD(m)
# convert to dataframe
comparisons <- as.data.frame(tukey_result$Club)
# filter pairs whose p-value<0.05
comparisons %>% filter(comparisons$p_adj<0.05) %>% select('p_adj') -> diff.groups

diff.groups

```

```

##
## p adj
## Real Madrid-1. FC Koln 2.511295e-02
## Arsenal-Ajax 1.834884e-03
## Chelsea-Ajax 6.883590e-06
## FC Barcelona-Ajax 0.000000e+00
## FC Bayern Munchen-Ajax 7.799390e-03
## Juventus-Ajax 1.197057e-06
## Liverpool-Ajax 4.626332e-04
## Manchester City-Ajax 2.133285e-10

```

## Manchester United-Ajax	2.821493e-06
## Paris Saint-Germain-Ajax	3.302312e-02
## Real Madrid-Ajax	0.000000e+00
## Tottenham Hotspur-Ajax	7.886491e-03
## Borussia Monchengladbach-Arsenal	4.678889e-02
## FC Barcelona-Arsenal	8.563170e-05
## FC Porto-Arsenal	2.349124e-04
## Lokomotiv Moscow-Arsenal	5.140377e-03
## Real Betis-Arsenal	3.099322e-03
## Real Madrid-Arsenal	1.862341e-06
## Sevilla FC-Arsenal	2.150618e-03
## Shakhtar Donetsk-Arsenal	7.211263e-04
## SL Benfica-Arsenal	4.378032e-04
## Sporting CP-Arsenal	1.580920e-03
## Valencia CF-Arsenal	1.652377e-02
## FC Barcelona-AS Monaco	1.036661e-04
## Real Madrid-AS Monaco	8.836859e-06
## FC Barcelona-Atalanta	9.280656e-04
## Real Madrid-Atalanta	1.744568e-04
## FC Barcelona-Athletic Club de Bilbao	1.610142e-07
## Manchester City-Athletic Club de Bilbao	1.002869e-03
## Real Madrid-Athletic Club de Bilbao	1.285119e-08
## FC Barcelona-Atlanta United	5.583994e-06
## Manchester City-Atlanta United	4.691294e-03
## Real Madrid-Atlanta United	7.883804e-07
## Chelsea-Atletico Madrid	1.467016e-02
## FC Barcelona-Atletico Madrid	0.000000e+00
## Juventus-Atletico Madrid	2.674798e-03
## Manchester City-Atletico Madrid	2.138569e-07
## Manchester United-Atletico Madrid	6.315549e-03
## Real Madrid-Atletico Madrid	0.000000e+00
## FC Barcelona-Atletico Mineiro	2.055530e-03
## Real Madrid-Atletico Mineiro	4.097010e-04
## Chelsea-Bayer 04 Leverkusen	2.420611e-02
## FC Barcelona-Bayer 04 Leverkusen	0.000000e+00
## Juventus-Bayer 04 Leverkusen	7.172260e-03
## Manchester City-Bayer 04 Leverkusen	3.037376e-06
## Manchester United-Bayer 04 Leverkusen	1.204359e-02
## Real Madrid-Bayer 04 Leverkusen	0.000000e+00
## FC Barcelona-Beijing Sinobo Guoan FC	1.502830e-07
## Manchester City-Beijing Sinobo Guoan FC	9.506477e-04
## Real Madrid-Beijing Sinobo Guoan FC	1.195561e-08
## FC Barcelona-Besiktas JK	1.322218e-08
## Manchester City-Besiktas JK	9.090731e-04
## Real Madrid-Besiktas JK	4.831603e-10
## Chelsea-Borussia Dortmund	2.695583e-03
## FC Barcelona-Borussia Dortmund	0.000000e+00
## Juventus-Borussia Dortmund	5.019623e-04
## Manchester City-Borussia Dortmund	6.275592e-08
## Manchester United-Borussia Dortmund	1.144452e-03
## Real Madrid-Borussia Dortmund	0.000000e+00
## Chelsea-Borussia Monchengladbach	4.799209e-04
## FC Barcelona-Borussia Monchengladbach	0.000000e+00
## Juventus-Borussia Monchengladbach	1.192235e-04

## Liverpool-Borussia Monchengladbach	1.685876e-02
## Manchester City-Borussia Monchengladbach	4.899771e-08
## Manchester United-Borussia Monchengladbach	2.195775e-04
## Real Madrid-Borussia Monchengladbach	0.000000e+00
## FC Barcelona-Burnley	1.804322e-03
## Real Madrid-Burnley	3.560522e-04
## FC Barcelona-Chelsea	1.048766e-02
## FC Porto-Chelsea	2.925234e-07
## FC Schalke 04-Chelsea	1.067740e-02
## Lokomotiv Moscow-Chelsea	8.150290e-05
## PSV-Chelsea	2.895770e-02
## Real Betis-Chelsea	5.833320e-06
## Real Madrid-Chelsea	3.903164e-04
## Real Sociedad-Chelsea	3.959850e-02
## Sevilla FC-Chelsea	6.158126e-06
## Shakhtar Donetsk-Chelsea	4.740856e-06
## SL Benfica-Chelsea	8.466345e-07
## Sporting CP-Chelsea	5.716677e-06
## TSG 1899 Hoffenheim-Chelsea	4.448708e-03
## Valencia CF-Chelsea	3.076726e-05
## Villarreal CF-Chelsea	1.740974e-03
## FC Barcelona-Cruzeiro	2.148066e-04
## Real Madrid-Cruzeiro	3.671585e-05
## FC Barcelona-Dalian YiFang FC	2.128191e-05
## Manchester City-Dalian YiFang FC	1.292920e-02
## Real Madrid-Dalian YiFang FC	3.204135e-06
## Real Madrid-Deportivo Alaves	2.142751e-02
## FC Barcelona-Everton	7.741238e-06
## Real Madrid-Everton	2.857095e-07
## FC Bayern Munchen-FC Barcelona	1.024963e-07
## FC Porto-FC Barcelona	0.000000e+00
## FC Schalke 04-FC Barcelona	1.594869e-11
## Fluminense-FC Barcelona	2.307627e-04
## Galatasaray SK-FC Barcelona	3.654206e-03
## Gremio-FC Barcelona	1.488522e-06
## Inter-FC Barcelona	0.000000e+00
## Juventus-FC Barcelona	4.720302e-03
## LA Galaxy-FC Barcelona	2.923333e-02
## Lazio-FC Barcelona	0.000000e+00
## Leicester City-FC Barcelona	3.827929e-07
## Liverpool-FC Barcelona	7.568211e-05
## Lokomotiv Moscow-FC Barcelona	0.000000e+00
## Los Angeles FC-FC Barcelona	2.923333e-02
## Manchester United-FC Barcelona	2.382378e-02
## Milan-FC Barcelona	3.785297e-10
## Napoli-FC Barcelona	1.911005e-11
## New York City FC-FC Barcelona	2.310216e-02
## Olympique de Marseille-FC Barcelona	8.110623e-12
## Olympique Lyonnais-FC Barcelona	2.830606e-07
## Paris Saint-Germain-FC Barcelona	1.596327e-07
## PFC CSKA Moscow-FC Barcelona	9.309295e-03
## PSV-FC Barcelona	1.693647e-08
## RB Leipzig-FC Barcelona	2.509331e-06
## RC Celta-FC Barcelona	2.119751e-07

## Real Betis-FC Barcelona	0.000000e+00
## Real Sociedad-FC Barcelona	2.866494e-09
## River Plate-FC Barcelona	4.950362e-02
## Roma-FC Barcelona	0.000000e+00
## Sassuolo-FC Barcelona	4.141989e-03
## SC Braga-FC Barcelona	3.965673e-02
## SD Eibar-FC Barcelona	1.293975e-04
## Sevilla FC-FC Barcelona	0.000000e+00
## Shakhtar Donetsk-FC Barcelona	0.000000e+00
## Shanghai SIPG FC-FC Barcelona	5.314756e-05
## SL Benfica-FC Barcelona	0.000000e+00
## Sporting CP-FC Barcelona	0.000000e+00
## SV Werder Bremen-FC Barcelona	2.478567e-04
## Torino-FC Barcelona	1.096283e-07
## Toronto FC-FC Barcelona	2.923333e-02
## Tottenham Hotspur-FC Barcelona	2.777772e-07
## TSG 1899 Hoffenheim-FC Barcelona	0.000000e+00
## Valencia CF-FC Barcelona	0.000000e+00
## VfB Stuttgart-FC Barcelona	2.857723e-04
## Villarreal CF-FC Barcelona	0.000000e+00
## Vissel Kobe-FC Barcelona	4.600696e-02
## Watford-FC Barcelona	4.773749e-05
## West Ham United-FC Barcelona	4.906538e-06
## Wolverhampton Wanderers-FC Barcelona	4.081688e-04
## FC Porto-FC Bayern Munchen	1.087903e-03
## Lokomotiv Moscow-FC Bayern Munchen	1.824857e-02
## Real Betis-FC Bayern Munchen	1.348787e-02
## Real Madrid-FC Bayern Munchen	8.375111e-10
## Sevilla FC-FC Bayern Munchen	9.263622e-03
## Shakhtar Donetsk-FC Bayern Munchen	2.983050e-03
## SL Benfica-FC Bayern Munchen	1.985709e-03
## Sporting CP-FC Bayern Munchen	6.762552e-03
## Juventus-FC Porto	2.856798e-08
## Liverpool-FC Porto	4.062932e-05
## Manchester City-FC Porto	0.000000e+00
## Manchester United-FC Porto	1.035798e-07
## Paris Saint-Germain-FC Porto	7.247566e-03
## Real Madrid-FC Porto	0.000000e+00
## Tottenham Hotspur-FC Porto	1.149911e-03
## Juventus-FC Schalke 04	4.470211e-03
## Manchester City-FC Schalke 04	9.867433e-06
## Manchester United-FC Schalke 04	5.939666e-03
## Real Madrid-FC Schalke 04	0.000000e+00
## Real Madrid-Fluminense	3.961475e-05
## Real Madrid-Galatasaray SK	7.628640e-04
## Manchester City-Gremio	5.416534e-03
## Real Madrid-Gremio	1.324008e-07
## Real Madrid-Guangzhou City F.C.	2.320426e-02
## Real Madrid-Hertha BSC	4.619540e-02
## Juventus-Inter	2.610845e-02
## Manchester City-Inter	6.490252e-06
## Manchester United-Inter	4.561660e-02
## Real Madrid-Inter	0.000000e+00
## Lazio-Juventus	2.457173e-02

## Lokomotiv Moscow-Juventus	2.802581e-05
## Olympique de Marseille-Juventus	2.309600e-02
## PSV-Juventus	1.675633e-02
## Real Betis-Juventus	6.543524e-07
## Real Madrid-Juventus	1.199916e-04
## Real Sociedad-Juventus	2.092294e-02
## Sevilla FC-Juventus	9.111339e-07
## Shakhtar Donetsk-Juventus	1.139170e-06
## SL Benfica-Juventus	1.059872e-07
## Sporting CP-Juventus	9.797041e-07
## TSG 1899 Hoffenheim-Juventus	1.530649e-03
## Valencia CF-Juventus	2.981071e-06
## Villarreal CF-Juventus	4.883145e-04
## Real Madrid-LA Galaxy	1.109073e-02
## Manchester City-Lazio	2.839816e-05
## Manchester United-Lazio	3.461028e-02
## Real Madrid-Lazio	0.000000e+00
## Manchester City-Leicester City	1.014632e-02
## Real Madrid-Leicester City	1.751452e-08
## Real Madrid-Levante UD	4.619540e-02
## Lokomotiv Moscow-Liverpool	1.985001e-03
## Real Betis-Liverpool	6.422143e-04
## Real Madrid-Liverpool	1.375335e-06
## Sevilla FC-Liverpool	5.016652e-04
## Shakhtar Donetsk-Liverpool	2.118185e-04
## SL Benfica-Liverpool	8.799256e-05
## Sporting CP-Liverpool	3.932397e-04
## Valencia CF-Liverpool	3.590526e-03
## Villarreal CF-Liverpool	4.681252e-02
## Manchester City-Lokomotiv Moscow	4.227228e-08
## Manchester United-Lokomotiv Moscow	4.147353e-05
## Real Madrid-Lokomotiv Moscow	0.000000e+00
## Tottenham Hotspur-Lokomotiv Moscow	1.783298e-02
## Real Madrid-Los Angeles FC	1.109073e-02
## Milan-Manchester City	2.157377e-03
## Napoli-Manchester City	6.235497e-04
## Olympique de Marseille-Manchester City	3.639140e-05
## Olympique Lyonnais-Manchester City	8.240374e-03
## PSV-Manchester City	1.700556e-04
## RB Leipzig-Manchester City	1.845091e-02
## RC Celta-Manchester City	1.240401e-03
## Real Betis-Manchester City	1.828471e-11
## Real Sociedad-Manchester City	1.211370e-04
## Roma-Manchester City	9.113381e-05
## SD Eibar-Manchester City	4.728068e-02
## Sevilla FC-Manchester City	9.344225e-11
## Shakhtar Donetsk-Manchester City	5.784637e-10
## Shanghai SIPG FC-Manchester City	2.525162e-02
## SL Benfica-Manchester City	0.000000e+00
## Sporting CP-Manchester City	1.652591e-10
## Torino-Manchester City	1.968604e-03
## TSG 1899 Hoffenheim-Manchester City	1.629670e-06
## Valencia CF-Manchester City	8.639911e-11
## Villarreal CF-Manchester City	2.662214e-07

## Olympique de Marseille-Manchester United	3.131849e-02
## PSV-Manchester United	1.868638e-02
## Real Betis-Manchester United	2.134494e-06
## Real Madrid-Manchester United	1.055953e-03
## Real Sociedad-Manchester United	2.455955e-02
## Sevilla FC-Manchester United	2.416367e-06
## Shakhtar Donetsk-Manchester United	2.137046e-06
## SL Benfica-Manchester United	3.182886e-07
## Sporting CP-Manchester United	2.333687e-06
## TSG 1899 Hoffenheim-Manchester United	2.288028e-03
## Valencia CF-Manchester United	1.089585e-05
## Villarreal CF-Manchester United	8.317039e-04
## Real Madrid-Milan	0.000000e+00
## Real Madrid-Montpellier HSC	2.935947e-02
## Real Madrid-Napoli	0.000000e+00
## Real Madrid-New York City FC	8.583027e-03
## Real Madrid-Olympique de Marseille	0.000000e+00
## Real Madrid-Olympique Lyonnais	1.272175e-08
## Real Madrid-Paris Saint-Germain	1.761488e-09
## Sevilla FC-Paris Saint-Germain	4.157651e-02
## Shakhtar Donetsk-Paris Saint-Germain	1.144891e-02
## SL Benfica-Paris Saint-Germain	1.114756e-02
## Sporting CP-Paris Saint-Germain	2.922742e-02
## Real Madrid-PFC CSKA Moscow	3.219561e-03
## Real Madrid-PSV	1.206517e-09
## Real Madrid-RB Leipzig	1.672827e-07
## Real Madrid-RC Celta	1.714043e-08
## Real Madrid-Real Betis	0.000000e+00
## Tottenham Hotspur-Real Betis	1.390913e-02
## Real Sociedad-Real Madrid	1.145553e-10
## River Plate-Real Madrid	1.977482e-02
## Roma-Real Madrid	0.000000e+00
## Sassuolo-Real Madrid	8.739064e-04
## SC Braga-Real Madrid	1.548760e-02
## SD Eibar-Real Madrid	2.146545e-05
## Sevilla FC-Real Madrid	0.000000e+00
## Shakhtar Donetsk-Real Madrid	0.000000e+00
## Shanghai SIPG FC-Real Madrid	8.390768e-06
## SL Benfica-Real Madrid	0.000000e+00
## Sporting CP-Real Madrid	0.000000e+00
## SV Werder Bremen-Real Madrid	4.273511e-05
## Torino-Real Madrid	6.146171e-09
## Toronto FC-Real Madrid	1.109073e-02
## Tottenham Hotspur-Real Madrid	2.709003e-09
## TSG 1899 Hoffenheim-Real Madrid	0.000000e+00
## Valencia CF-Real Madrid	0.000000e+00
## VfB Stuttgart-Real Madrid	4.970649e-05
## Villarreal CF-Real Madrid	0.000000e+00
## Vissel Kobe-Real Madrid	1.823866e-02
## Watford-Real Madrid	5.163173e-06
## West Ham United-Real Madrid	2.114922e-07
## Wolverhampton Wanderers-Real Madrid	5.120338e-05
## Tottenham Hotspur-Sevilla FC	9.438747e-03
## Tottenham Hotspur-Shakhtar Donetsk	2.974866e-03



```
## Tottenham Hotspur-SL Benfica                2.059473e-03
## Tottenham Hotspur-Sporting CP                 6.847648e-03
```

By doing pairwise comparisons using **Tukeys method** the mean wages of the above club combinations are different.

Out of **4095 pairs**, **280** club pairs are **different**.

- Does wage differ by clubs after controlling other variables ?

ANCOVA Test

$$\text{wage} = f(\text{value} + \text{overall} + \text{strength} + \text{club})$$

```
Anova(lm(Wage_in_K ~ Overall+Value_in_M+Balance+Strength+Club, data=data), type=3)
```

```
## Warning in printHypothesis(L, rhs, names(b)): one or more coefficients in the hypothesis include
## arithmetic operators in their names;
## the printed representation of the hypothesis will be omitted
```

```
## Anova Table (Type III tests)
##
## Response: Wage_in_K
##      Sum Sq Df F value    Pr(>F)
## (Intercept) 111895  1 159.008 < 2.2e-16 ***
## Overall      110017  1 156.339 < 2.2e-16 ***
## Value_in_M    21610  1  30.709 5.417e-08 ***
## Balance       25590  1  36.365 3.696e-09 ***
## Strength      10919  1  15.517 9.634e-05 ***
## Club          741205 90 11.703 < 2.2e-16 ***
## Residuals    284296 404
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

From individual f-test, p-value of **Club** « 0.05. **Club** is a **significant** predictor of a player's wage after controlling other factors like value, balance, strength and overall.

```
library(emmeans)
m <- lm(Wage_in_K ~ Overall+Value_in_M+Balance+Strength+Club, data=data)
emmeans.result <- emmeans(m, specs = "Club", contr = "pairwise", adjust="tukey")$contrast
emmeans.data <- as.data.frame(emmeans.result)
emmeans.data %>% filter(p.value<0.05) %>% view()
```

```
m <- lm(Wage_in_K ~ Overall+Value_in_M+Balance+Strength+Club, data=data) #R2=0.875
m <- lm(Wage_in_K ~ Overall+Value_in_M+Balance+Strength+Potential+Club, data=data) #R2=0.905
m <- lm(Wage_in_K ~ Overall+Value_in_M+Balance+Strength+Potential+Age+Club, data=data) #R2=0.909
summary(m)
```

```
##
## Call:
## lm(formula = Wage_in_K ~ Overall + Value_in_M + Balance + Strength +
## Potential + Age + Club, data = data)
##
```

```

## Residuals:
##      Min       1Q   Median       3Q      Max
## -82.953  -8.435  -0.075   8.022 133.447
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -226.79499   102.51666   -2.212 0.027509 *
## Overall         4.97437     1.68685    2.949 0.003375 **
## Value_in_M      2.36577     0.20829   11.358 < 2e-16 ***
## Balance         0.37235     0.09634    3.865 0.000130 ***
## Strength        0.39790     0.11578    3.437 0.000650 ***
## Potential      -3.89379     0.89247   -4.363 1.63e-05 ***
## Age             3.30807     0.77747    4.255 2.60e-05 ***
## ClubAjax       -7.98698    24.95396   -0.320 0.749082
## ClubAl Hilal    1.66722    33.07785    0.050 0.959826
## ClubAl Nassr   -14.12328    33.09402   -0.427 0.669781
## ClubArsenal     69.29429    24.22144    2.861 0.004445 **
## ClubAS Monaco   31.09175    26.08366    1.192 0.233964
## ClubAS Saint Etienne -21.19291    32.82916   -0.646 0.518938
## ClubAtalanta -22.38847    28.58946   -0.783 0.434028
## ClubAthletic Club de Bilbao -15.59350    27.06090   -0.576 0.564777
## ClubAtlanta United -18.33177    28.54478   -0.642 0.521102
## ClubAtletico Madrid  0.04679    24.02098    0.002 0.998447
## ClubAtletico Mineiro -11.17928    28.60215   -0.391 0.696112
## ClubBasaksehir FK  -23.51314    33.00692   -0.712 0.476649
## ClubBayer 04 Leverkusen 28.60606    24.46622    1.169 0.243013
## ClubBeijing Sinobo Guoan FC -32.06810    27.09545   -1.184 0.237301
## ClubBesiktas JK    9.71341    25.73710    0.377 0.706069
## ClubBorussia Dortmund 15.51050    24.35438    0.637 0.524574
## ClubBorussia Monchengladbach -5.42049    24.99158   -0.217 0.828402
## ClubBurnley      36.33409    28.44527    1.277 0.202222
## ClubChelsea      78.38260    24.10157    3.252 0.001242 **
## ClubCruzeiro     -6.25390    28.75921   -0.217 0.827962
## ClubCrystal Palace 17.36763    33.02193    0.526 0.599218
## ClubDalian YiFang FC -37.89394    28.48867   -1.330 0.184226
## ClubDeportivo Alaves 10.62677    32.76253    0.324 0.745836
## ClubEintracht Frankfurt 12.74346    32.95526    0.387 0.699191
## ClubEverton      67.90687    24.96348    2.720 0.006806 **
## ClubFC Barcelona 133.95645    24.05953    5.568 4.73e-08 ***
## ClubFC Bayern Munchen 29.73362    24.09925    1.234 0.217999
## ClubFC Porto     -33.67927    24.61066   -1.368 0.171925
## ClubFC Schalke 04  -1.52671    25.44286   -0.060 0.952181
## ClubFenerbahce SK  41.09996    33.21891    1.237 0.216718
## ClubFluminense   -8.87568    28.83642   -0.308 0.758399
## ClubFulham       23.81941    33.02847    0.721 0.471219
## ClubGalatasaray SK 19.62557    28.60735    0.686 0.493088
## ClubGirona FC    -1.22828    32.96203   -0.037 0.970293
## ClubGremio      -14.22352    26.91634   -0.528 0.597490
## ClubGuangzhou City F.C. -23.06335    33.05855   -0.698 0.485798
## ClubGuangzhou Evergrande Taobao FC 46.72062    28.55220    1.636 0.102555
## ClubHertha BSC   -14.42292    32.80156   -0.440 0.660389
## ClubInter       19.26507    24.13884    0.798 0.425287
## ClubJuventus     68.01248    24.01209    2.832 0.004852 **
## ClubLA Galaxy    -51.00637    33.02028   -1.545 0.123206

```

## ClubLazio	5.48029	24.70694	0.222	0.824573	
## ClubLeicester City	34.35654	25.50732	1.347	0.178762	
## ClubLevante UD	-20.85396	33.00844	-0.632	0.527892	
## ClubLiverpool	67.35040	24.16688	2.787	0.005574	**
## ClubLokomotiv Moscow	-49.21773	26.20619	-1.878	0.061092	.
## ClubLos Angeles FC	-39.88643	33.03090	-1.208	0.227931	
## ClubManchester City	86.79340	24.11599	3.599	0.000359	***
## ClubManchester United	87.21131	24.14385	3.612	0.000342	***
## ClubMilan	54.58297	24.26825	2.249	0.025044	*
## ClubMontpellier HSC	21.95208	32.74726	0.670	0.503021	
## ClubNapoli	23.50480	24.21990	0.970	0.332393	
## ClubNew York City FC	-41.27197	33.26537	-1.241	0.215444	
## ClubOGC Nice	-15.10635	32.87189	-0.460	0.646086	
## ClubOlympique de Marseille	3.35596	24.96072	0.134	0.893114	
## ClubOlympique Lyonnais	19.57770	25.78997	0.759	0.448225	
## ClubParis Saint-Germain	25.45350	24.21892	1.051	0.293901	
## ClubPFC CSKA Moscow	-46.45280	32.86860	-1.413	0.158345	
## ClubPSV	-4.05635	26.83630	-0.151	0.879932	
## ClubRB Leipzig	11.53679	26.11173	0.442	0.658854	
## ClubRC Celta	-9.12547	26.86326	-0.340	0.734259	
## ClubReal Betis	-5.93228	24.49599	-0.242	0.808769	
## ClubReal Madrid	140.08670	24.08646	5.816	1.23e-08	***
## ClubReal Sociedad	-0.35696	25.98127	-0.014	0.989045	
## ClubRiver Plate	-6.78092	32.94641	-0.206	0.837038	
## ClubRoma	25.11358	24.38120	1.030	0.303611	
## ClubSampdoria	-14.60705	33.36495	-0.438	0.661769	
## ClubSassuolo	15.19416	28.48689	0.533	0.594070	
## ClubSC Braga	-14.85006	32.95840	-0.451	0.652542	
## ClubSD Eibar	-16.56018	28.70025	-0.577	0.564259	
## ClubSevilla FC	-31.43340	24.82202	-1.266	0.206121	
## ClubShakhtar Donetsk	-49.44239	25.81396	-1.915	0.056159	.
## ClubShanghai SIPG FC	-33.29996	28.52954	-1.167	0.243818	
## ClubSL Benfica	-25.03685	24.75749	-1.011	0.312489	
## ClubSouthampton	30.40887	32.93028	0.923	0.356336	
## ClubSporting CP	-31.31411	24.92947	-1.256	0.209806	
## ClubStoke City	32.94371	32.81275	1.004	0.315987	
## ClubSV Werder Bremen	-6.62486	28.38402	-0.233	0.815569	
## ClubTorino	3.96311	26.16395	0.151	0.879679	
## ClubToronto FC	-47.27356	33.07337	-1.429	0.153679	
## ClubTottenham Hotspur	47.26556	24.05538	1.965	0.050118	.
## ClubTSG 1899 Hoffenheim	3.05104	25.22323	0.121	0.903782	
## ClubValencia CF	5.12341	24.25241	0.211	0.832796	
## ClubVfB Stuttgart	13.66387	28.58785	0.478	0.632938	
## ClubVfL Wolfsburg	19.06694	32.66723	0.584	0.559769	
## ClubVillarreal CF	-10.37275	24.97828	-0.415	0.678165	
## ClubVissel Kobe	-62.82868	33.21585	-1.892	0.059273	.
## ClubWatford	28.67260	26.95339	1.064	0.288065	
## ClubWest Ham United	50.16595	25.20006	1.991	0.047190	*
## ClubWolverhampton Wanderers	35.56372	26.93272	1.320	0.187431	
## ---					
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					
##					
## Residual standard error: 23.07 on 402 degrees of freedom					
## Multiple R-squared: 0.9264, Adjusted R-squared: 0.9088					

## F-statistic: 52.72 on 96 and 402 DF, p-value: < 2.2e-16

	Model	Adjusted R2	Global Test
1.	$Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{value} + \beta_3 x_{balance} + \beta_4 x_{strength} + \beta_5 x_{club}$	\(0.875\)	Significant
2.	$Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{value} + \beta_3 x_{balance} + \beta_4 x_{strength} + \beta_5 x_{potential} + \beta_6 x_{club}$	\(0.905\)	Significant
3.	$Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{value} + \beta_3 x_{balance} + \beta_4 x_{strength} + \beta_5 x_{potential} + \beta_6 x_{age} + \beta_7 x_{club}$	\(0.909\)	Significant

- From the analysis after including group variable Club in the model, it explains much **higher** variability in wage i.e from **65%** to around **87%**.
- By adding other variables, **R2** of the model increases to **0.90**.
- $Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{value} + \beta_3 x_{balance} + \beta_4 x_{strength} + \beta_5 x_{potential} + \beta_6 x_{age} + \beta_7 x_{club}$  is the **best model** as it has highest accuracy.

- Adding group variable 'Nationality'

- Does wage vary by nationalaity ?

```
m <- aov(Wage_in_K ~ Nationality, data=data)
summary(m)
```

ANOVA test

```
##           Df  Sum Sq Mean Sq F value Pr(>F)
## Nationality  58   360887    6222   1.075   0.337
## Residuals  440  2546243    5787
```

Model is **not** significant as p-value of *nationality* > 0.05. We have significant evidence that wages of player does not vary by their nationality.

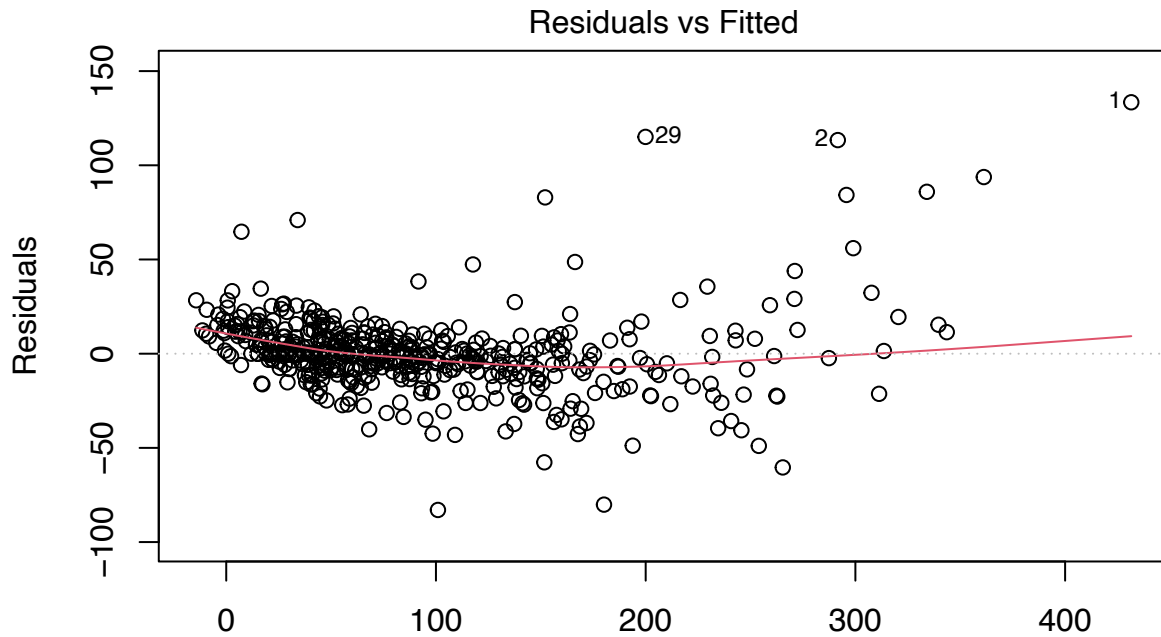
Final model

$$Y_{wage} = \beta_0 + \beta_1 x_{overall} + \beta_2 x_{value} + \beta_3 x_{balance} + \beta_4 x_{strength} + \beta_5 x_{potential} + \beta_6 x_{age} + \beta_7 x_{club}$$

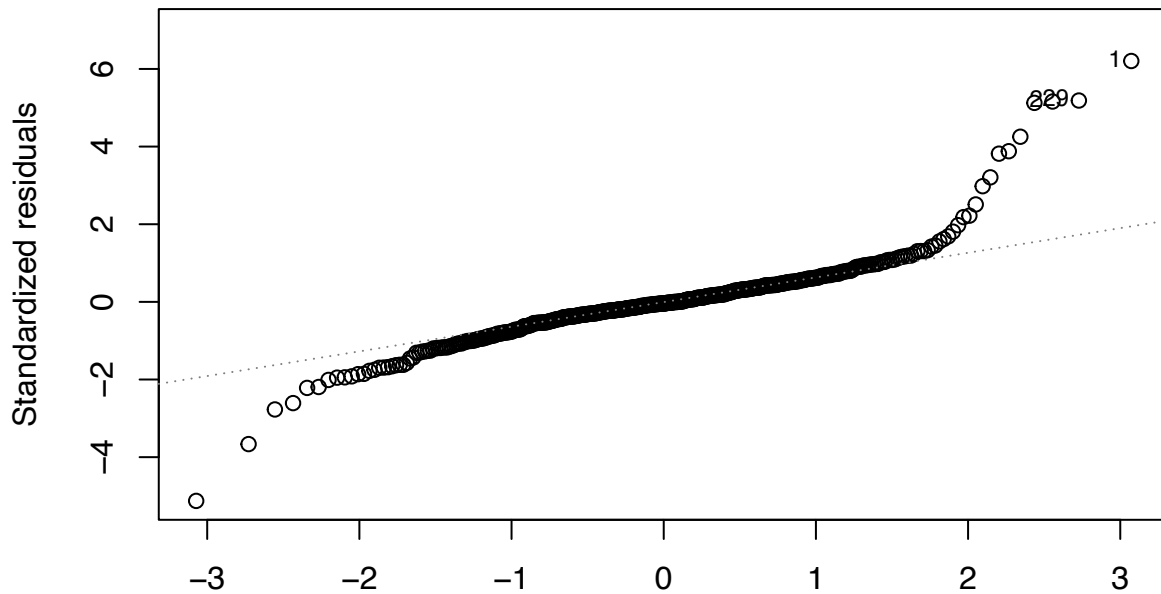
```
mlr.final = lm(Wage_in_K ~ Overall+Value_in_M+Balance+Strength+Potential+Age+Club, data=data)
plot(mlr.final)
```

Aceses linear assumption

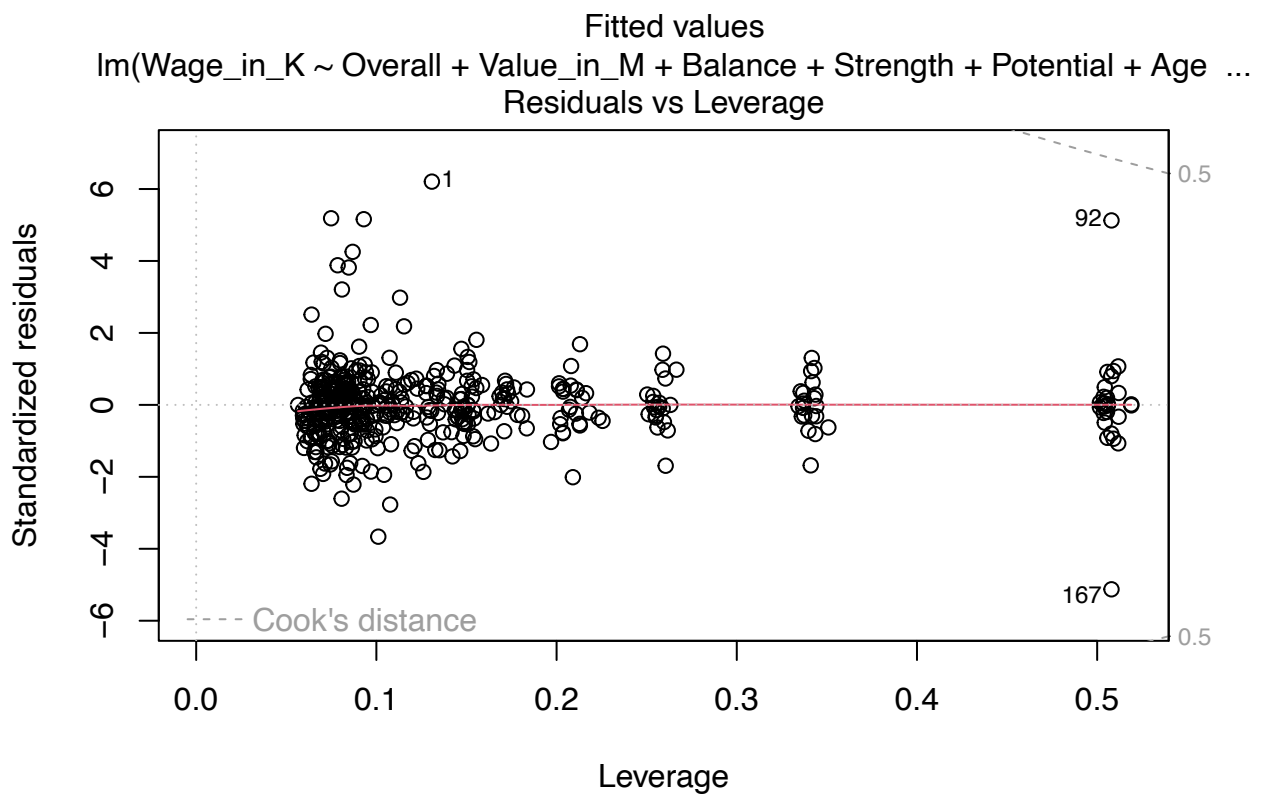
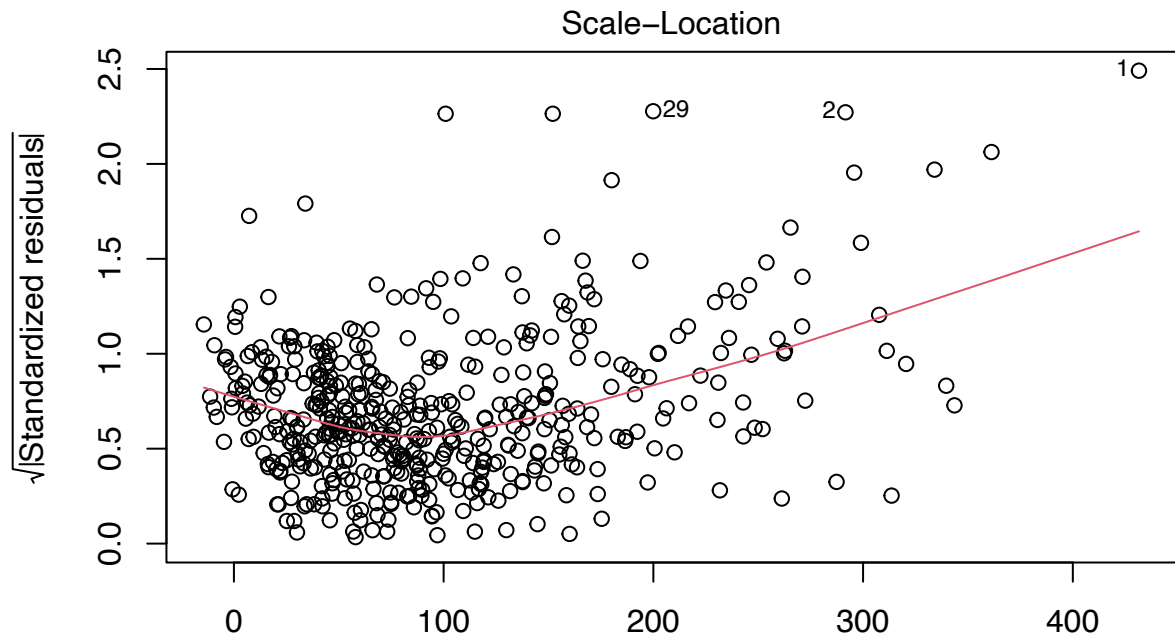
```
## Warning: not plotting observations with leverage one:
## 77, 110, 148, 190, 207, 209, 223, 257, 271, 277, 280, 294, 316, 331, 332, 360, 390, 398, 404, 405,
```



Im(Wage\_in\_K ~ Overall + Value\_in\_M + Balance + Strength + Potential + Age ...  
Q-Q Residuals



Im(Wage\_in\_K ~ Overall + Value\_in\_M + Balance + Strength + Potential + Age ...



## Conclusion

Wage of soccer player depends on **value, overall rating, balance rating, potential, strength rating, age and club**. Given these factors are known, wage of a player could be calculated with **90%** accuracy.

Although model explains 90% of wage, its linear assumptions may **not** be met since their is increasing

variance of residuals with higher fitted values.