FIFA 20 Predicting Player Value

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```r
fifa20 <- fread("~/Desktop/Northeastern-University/SML/FIFA-Player-Assessment-Model-and-Analytics/Datase
fifa20 <- as_tibble(fifa20)
```

Data cleaning

```r
# remove columns that are not required for modeling
updated_fifa20 <- fifa20 %>% select(-player_url, -long_name, -dob, -real_face, -player_tags,
                                    -loaned_from, -joined, -player_positions, -contract_valid_until,
                                    -nation_position, -nation_jersey_number, -player_traits, -gk_diving
                                    -gk_handling, -gk_kicking, -gk_reflexes, -gk_speed, -gk_positioning
                                    -goalkeeping_diving, -goalkeeping_handling, -goalkeeping_kicking,
                                    -goalkeeping_positioning, -goalkeeping_reflexes,
                                    -ls, -st, -rs, -lw, -lf, -cf, -rf, -rw, -lam, -cam, -ram,
                                    -lm, -lcm, -cm, -rcm, -rm, -lwb, -ldm, -cdm, -rdm, -rwb,
                                    -lb, -lcb, -cb, -rcb, -rb)

# remove oberservations that have missing values (NOT processing Goalkeepers)
clean_fifa20 <- na.omit(updated_fifa20)
clean_fifa20
```

```
## # A tibble: 15,077 x 55
##    sofifa_id short_name     age height_cm weight_kg nationality  club  overall
##        <int> <chr>        <int>     <int>     <int> <chr>        <chr>   <int>
## 1     158023 L. Messi        32       170        72 Argentina    FC B~      94
## 2      20801 Cristiano~      34       187        83 Portugal     Juve~      93
## 3     190871 Neymar Jr       27       175        68 Brazil       Pari~      92
## 4     183277 E. Hazard       28       175        74 Belgium      Real~      91
## 5     192985 K. De Bru~      28       181        70 Belgium      Manc~      91
## 6     203376 V. van Di~      27       193        92 Netherlands  Live~      90
## 7     177003 L. Modrić       33       172        66 Croatia      Real~      90
## 8     209331 M. Salah        27       175        71 Egypt        Live~      90
## 9     231747 K. Mbappé       20       178        73 France       Pari~      89
## 10    201024 K. Koulib~      28       187        89 Senegal      Napo~      89
## # ... with 15,067 more rows, and 47 more variables: potential <int>,
## #   value_eur <int>, wage_eur <int>, preferred_foot <chr>,
## #   international_reputation <int>, weak_foot <int>, skill_moves <int>,
## #   work_rate <chr>, body_type <chr>, release_clause_eur <int>,
## #   team_position <chr>, team_jersey_number <int>, pace <int>,
## #   shooting <int>, passing <int>, dribbling <int>, defending <int>,
## #   physic <int>, attacking_crossing <int>, attacking_finishing <int>,
## #   attacking_heading_accuracy <int>, attacking_short_passing <int>,
## #   attacking_volleys <int>, skill_dribbling <int>, skill_curve <int>,
## #   skill_fk_accuracy <int>, skill_long_passing <int>,
## #   skill_ball_control <int>, movement_acceleration <int>,
```

```
## #   movement_sprint_speed <int>, movement_agility <int>,
## #   movement_reactions <int>, movement_balance <int>,
## #   power_shot_power <int>, power_jumping <int>, power_stamina <int>,
## #   power_strength <int>, power_long_shots <int>,
## #   mentality_aggression <int>, mentality_interceptions <int>,
## #   mentality_positioning <int>, mentality_vision <int>,
## #   mentality_penalties <int>, mentality_composure <int>,
## #   defending_marking <int>, defending_standing_tackle <int>,
## #   defending_sliding_tackle <int>
```

```
df <- sample_n(clean_fifa20, nrow(clean_fifa20))
df <- df %>% select(-short_name, -nationality, -club, -body_type, -team_jersey_number, -team_position)
```

Fit a linear model for player value

```
value.fit <- lm(value_eur ~., data=df)
summary(value.fit)
```

```
##
## Call:
## lm(formula = value_eur ~ ., data = df)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9303357  -127953    -2163   111442 10602758
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              -1.249e+06  3.342e+05  -3.737 0.000187 ***
## sofifa_id                 3.385e-01  3.087e-01   1.096 0.272962
## age                      -1.318e+04  2.953e+03  -4.463 8.15e-06 ***
## height_cm                -3.803e+02  1.538e+03  -0.247 0.804772
## weight_kg                 2.973e+03  1.324e+03   2.246 0.024736 *
## overall                   3.440e+04  2.948e+03  11.670  < 2e-16 ***
## potential                -2.073e+04  2.097e+03  -9.885  < 2e-16 ***
## wage_eur                  3.441e+00  4.606e-01   7.470 8.48e-14 ***
## preferred_footRight      -1.759e+04  1.220e+04  -1.442 0.149253
## international_reputation  5.098e+05  1.872e+04  27.224  < 2e-16 ***
## weak_foot                 9.110e+03  8.509e+03   1.071 0.284342
## skill_moves               1.595e+04  1.241e+04   1.285 0.198701
## work_rateHigh/Low         2.224e+04  3.360e+04   0.662 0.508039
## work_rateHigh/Medium     -1.728e+04  2.378e+04  -0.727 0.467373
## work_rateLow/High        -1.329e+04  3.942e+04  -0.337 0.736083
## work_rateLow/Low         -5.144e+04  1.149e+05  -0.448 0.654419
## work_rateLow/Medium      -1.752e+03  3.850e+04  -0.045 0.963710
## work_rateMedium/High     -3.382e+04  2.654e+04  -1.274 0.202549
## work_rateMedium/Low      -2.339e+04  3.155e+04  -0.741 0.458487
## work_rateMedium/Medium   -9.014e+03  2.288e+04  -0.394 0.693650
## release_clause_eur        4.928e-01  9.969e-04 494.286  < 2e-16 ***
## pace                      1.178e+04  1.721e+04   0.684 0.493863
```

```
## shooting                     -9.723e+03  1.745e+04  -0.557 0.577394
## passing                       1.245e+04  1.732e+04   0.719 0.472121
## dribbling                    -1.199e+04  1.743e+04  -0.688 0.491701
## defending                     5.747e+03  1.746e+04   0.329 0.742090
## physic                       -1.110e+04  1.746e+04  -0.636 0.524900
## attacking_crossing           -4.732e+03  3.531e+03  -1.340 0.180300
## attacking_finishing           2.355e+03  7.899e+03   0.298 0.765602
## attacking_heading_accuracy   -2.010e+03  1.911e+03  -1.052 0.292674
## attacking_short_passing      -4.884e+03  6.229e+03  -0.784 0.433085
## attacking_volleys             3.613e+03  1.135e+03   3.182 0.001463 **
## skill_dribbling               4.740e+03  8.784e+03   0.540 0.589482
## skill_curve                  -2.743e+03  1.120e+03  -2.449 0.014340 *
## skill_fk_accuracy             7.928e+02  1.067e+03   0.743 0.457618
## skill_long_passing            2.072e+02  2.752e+03   0.075 0.939997
## skill_ball_control           -4.905e+02  5.432e+03  -0.090 0.928050
## movement_acceleration        -4.475e+03  7.782e+03  -0.575 0.565278
## movement_sprint_speed        -6.179e+03  9.541e+03  -0.648 0.517236
## movement_agility              2.862e+03  1.934e+03   1.480 0.138824
## movement_reactions            2.644e+03  1.511e+03   1.750 0.080223 .
## movement_balance              1.581e+03  1.182e+03   1.338 0.180884
## power_shot_power              1.256e+03  3.576e+03   0.351 0.725523
## power_jumping                 6.226e+02  1.023e+03   0.609 0.542727
## power_stamina                 7.412e+03  4.410e+03   1.681 0.092818 .
## power_strength                6.597e+03  8.761e+03   0.753 0.451421
## power_long_shots              1.122e+03  3.580e+03   0.313 0.754055
## mentality_aggression          7.258e+02  3.541e+03   0.205 0.837581
## mentality_interceptions      -1.411e+03  3.588e+03  -0.393 0.694051
## mentality_positioning         4.508e+02  1.194e+03   0.378 0.705780
## mentality_vision             -4.586e+02  3.573e+03  -0.128 0.897872
## mentality_penalties           9.121e+02  1.128e+03   0.808 0.418876
## mentality_composure          -8.480e+02  9.529e+02  -0.890 0.373532
## defending_marking            -9.674e+02  5.287e+03  -0.183 0.854819
## defending_standing_tackle    -2.289e+03  5.372e+03  -0.426 0.670015
## defending_sliding_tackle     -2.520e+03  2.088e+03  -1.207 0.227386
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 615000 on 15021 degrees of freedom
## Multiple R-squared:  0.9887, Adjusted R-squared:  0.9887
## F-statistic: 2.396e+04 on 55 and 15021 DF,  p-value: < 2.2e-16
```

```r
names(value.fit)
```

```
##  [1] "coefficients"  "residuals"     "effects"       "rank"
##  [5] "fitted.values" "assign"        "qr"            "df.residual"
##  [9] "contrasts"     "xlevels"       "call"          "terms"
## [13] "model"
```

Exploring predictors that have an impact on player value

```
# overall
fit_overall <- lm(log(value_eur) ~ log(overall), data = df)
summary(fit_overall)
```

```
##
## Call:
## lm(formula = log(value_eur) ~ log(overall), data = df)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.39530 -0.26896  0.01286  0.34195  1.37769
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -38.14642    0.14947  -255.2   <2e-16 ***
## log(overall)  12.37987    0.03566   347.1   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.4606 on 15075 degrees of freedom
## Multiple R-squared:  0.8888, Adjusted R-squared:  0.8888
## F-statistic: 1.205e+05 on 1 and 15075 DF,  p-value: < 2.2e-16
```

```
plot(log(value_eur) ~ log(overall), data = df)
abline(fit_overall, col="red")
```
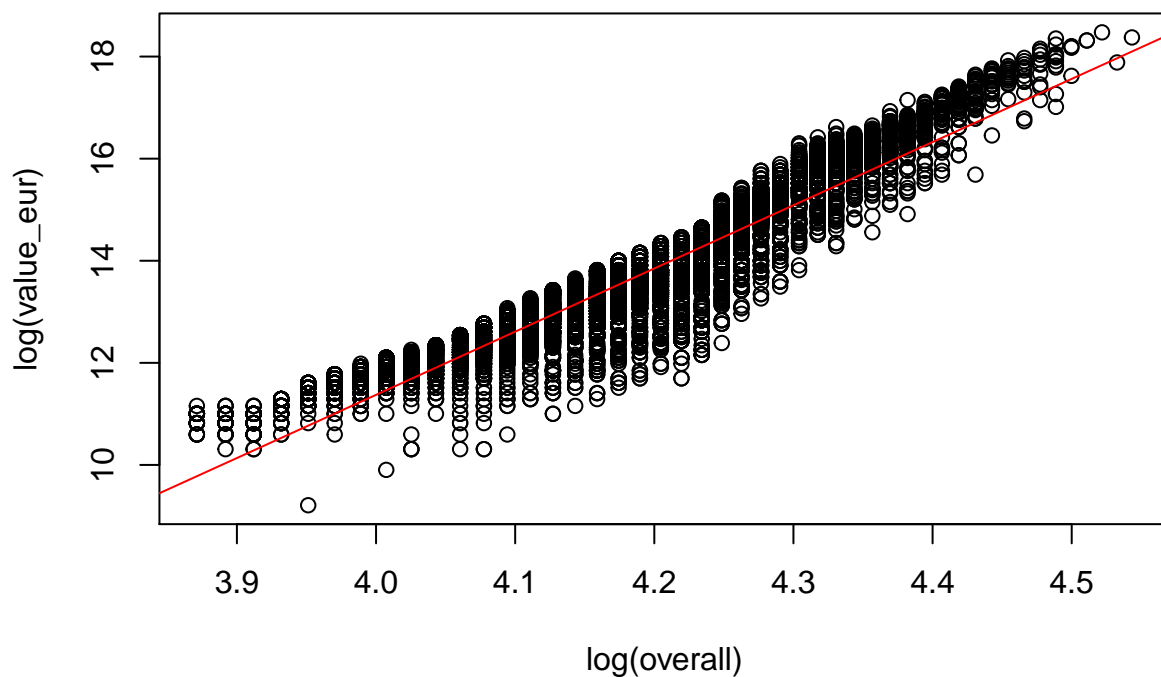
```r
# potential
fit_potential <- lm(log(value_eur) ~ log(potential), data = df)
summary(fit_potential)
```

```
##
## Call:
## lm(formula = log(value_eur) ~ log(potential), data = df)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.2257 -0.5837  0.1930  0.6245  1.5813
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -40.20515    0.35716  -112.6   <2e-16 ***
## log(potential)  12.63674    0.08367   151.0   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.8713 on 15075 degrees of freedom
## Multiple R-squared:  0.6021, Adjusted R-squared:  0.602
## F-statistic: 2.281e+04 on 1 and 15075 DF,  p-value: < 2.2e-16
```

```r
plot(log(value_eur) ~ log(potential), data = df)
abline(fit_potential, col="red")
```
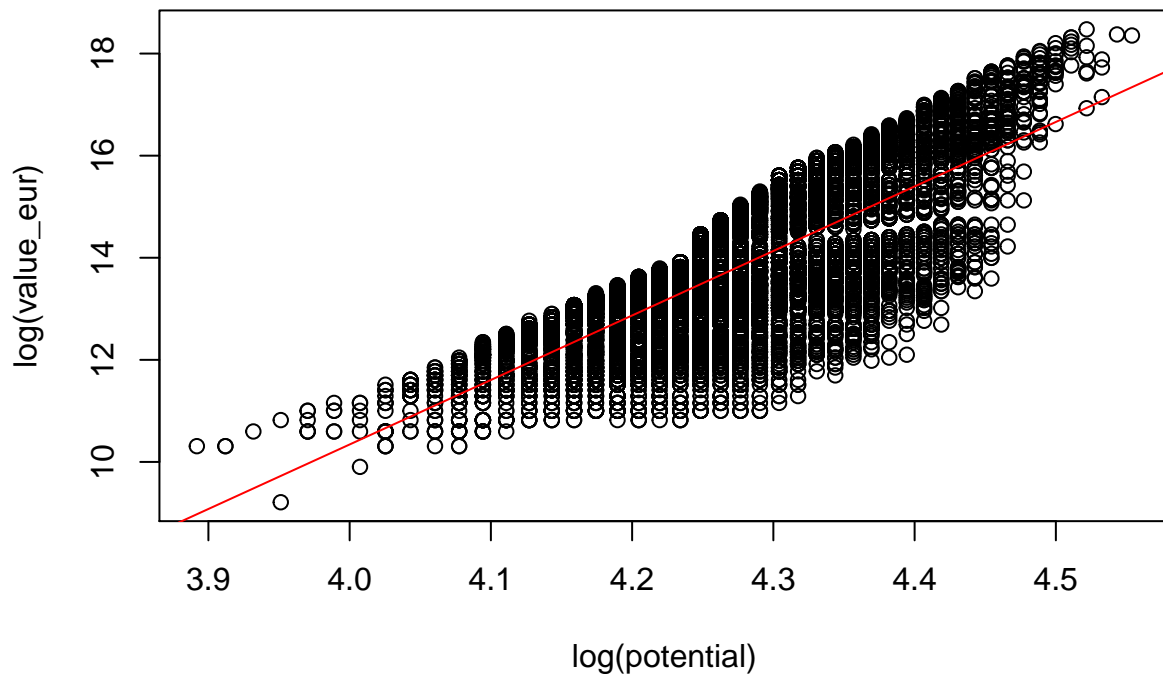
```
# release_clause_eur
fit_rc <- lm(value_eur ~ release_clause_eur, data = df)
summary(fit_rc)
```

```
##
## Call:
## lm(formula = value_eur ~ release_clause_eur, data = df)
##
## Residuals:
##        Min        1Q     Median        3Q       Max
## -10713589   -115912    -42053     75555  10669233
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)        9.319e+04  5.824e+03      16   <2e-16 ***
## release_clause_eur 5.156e-01  4.781e-04    1078   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 654100 on 15075 degrees of freedom
## Multiple R-squared:  0.9872, Adjusted R-squared:  0.9872
## F-statistic: 1.163e+06 on 1 and 15075 DF,  p-value: < 2.2e-16
```

```
plot(value_eur ~ release_clause_eur, data = df)
abline(fit_rc, col="red")
```
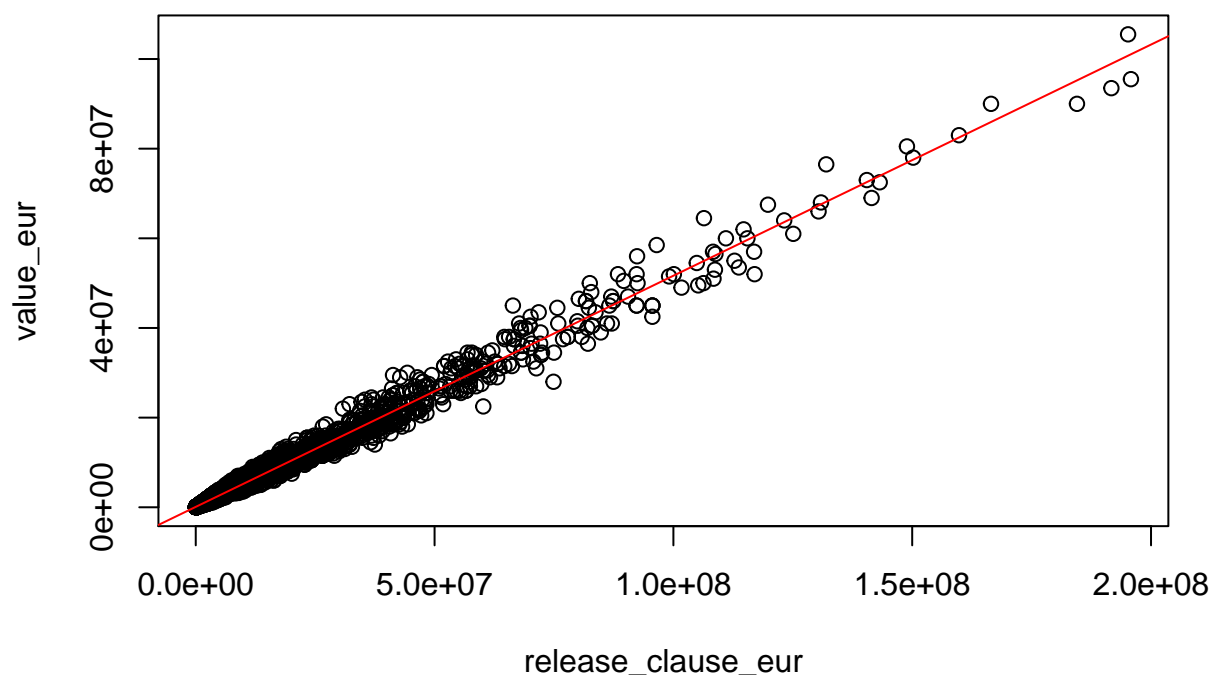
```
# attacking_volleys
fit_av <- lm(log(value_eur) ~ log(attacking_volleys), data = df)
summary(fit_av)
```

```
##
## Call:
## lm(formula = log(value_eur) ~ log(attacking_volleys), data = df)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.8170 -0.8844 -0.1681  0.7983  6.2322
##
## Coefficients:
##                        Estimate Std. Error t value Pr(>|t|)
## (Intercept)             7.35893    0.11339   64.90   <2e-16 ***
## log(attacking_volleys)  1.68109    0.02983   56.36   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.255 on 15075 degrees of freedom
## Multiple R-squared:  0.174,  Adjusted R-squared:  0.174
## F-statistic:  3176 on 1 and 15075 DF,  p-value: < 2.2e-16
```

```
plot(log(value_eur) ~ log(attacking_volleys), data = df)
abline(fit_av, col="red")
```
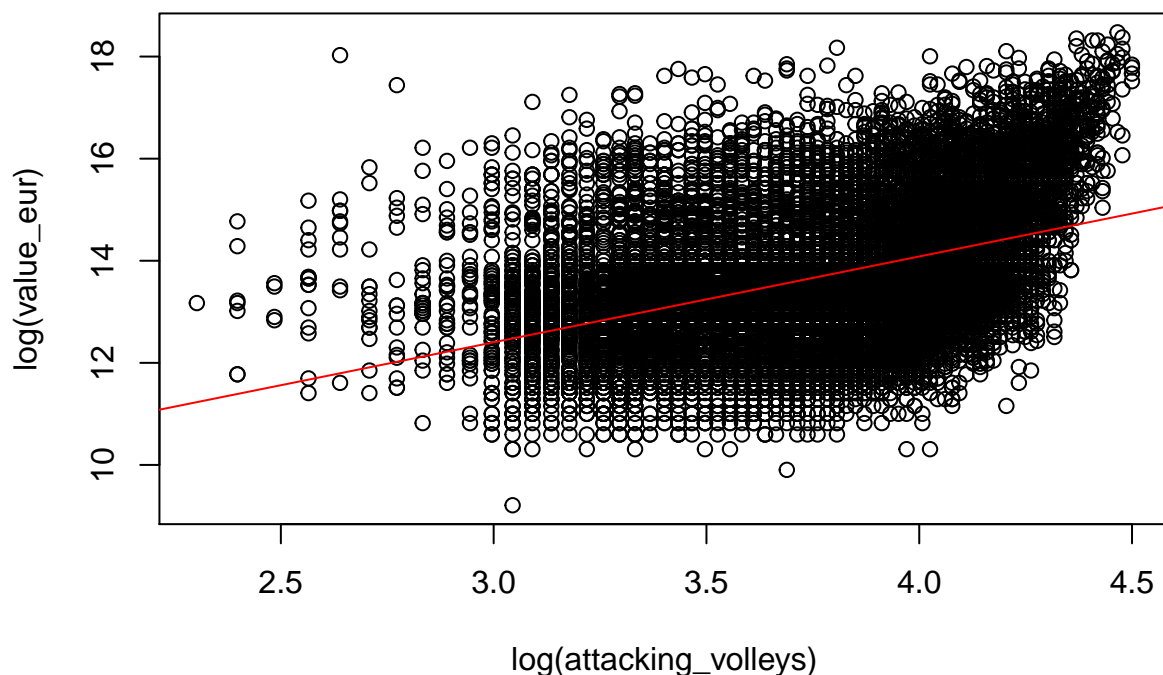

```

# Feature Selection: Forward Stepwise Selection

```r
df <- sample_n(clean_fifa20, nrow(clean_fifa20))
df <- df %>% select(-short_name, -nationality, -club, -body_type, -team_jersey_number, -team_position)

library(leaps)
regfit.fwd=regsubsets(value_eur~.,df, method="forward")
reg.summary <- summary(regfit.fwd)
reg.summary
```

```
## Subset selection object
## Call: regsubsets.formula(value_eur ~ ., df, method = "forward")
## 55 Variables  (and intercept)
##                           Forced in Forced out
## sofifa_id                     FALSE      FALSE
## age                           FALSE      FALSE
## height_cm                     FALSE      FALSE
## weight_kg                     FALSE      FALSE
## overall                       FALSE      FALSE
## potential                     FALSE      FALSE
## wage_eur                      FALSE      FALSE
## preferred_footRight           FALSE      FALSE
## international_reputation       FALSE      FALSE
## weak_foot                     FALSE      FALSE
## skill_moves                   FALSE      FALSE
## work_rateHigh/Low             FALSE      FALSE
## work_rateHigh/Medium          FALSE      FALSE
## work_rateLow/High             FALSE      FALSE
## work_rateLow/Low              FALSE      FALSE
## work_rateLow/Medium           FALSE      FALSE
## work_rateMedium/High          FALSE      FALSE
## work_rateMedium/Low           FALSE      FALSE
## work_rateMedium/Medium        FALSE      FALSE
## release_clause_eur            FALSE      FALSE
## pace                          FALSE      FALSE
## shooting                      FALSE      FALSE
## passing                       FALSE      FALSE
## dribbling                     FALSE      FALSE
## defending                     FALSE      FALSE
## physic                        FALSE      FALSE
## attacking_crossing            FALSE      FALSE
## attacking_finishing           FALSE      FALSE
## attacking_heading_accuracy    FALSE      FALSE
## attacking_short_passing       FALSE      FALSE
## attacking_volleys             FALSE      FALSE
## skill_dribbling               FALSE      FALSE
## skill_curve                   FALSE      FALSE
## skill_fk_accuracy             FALSE      FALSE
## skill_long_passing            FALSE      FALSE
## skill_ball_control            FALSE      FALSE
## movement_acceleration         FALSE      FALSE
## movement_sprint_speed         FALSE      FALSE
```

```
## movement_agility                FALSE      FALSE
## movement_reactions              FALSE      FALSE
## movement_balance                FALSE      FALSE
## power_shot_power                FALSE      FALSE
## power_jumping                   FALSE      FALSE
## power_stamina                   FALSE      FALSE
## power_strength                  FALSE      FALSE
## power_long_shots                FALSE      FALSE
## mentality_aggression            FALSE      FALSE
## mentality_interceptions         FALSE      FALSE
## mentality_positioning           FALSE      FALSE
## mentality_vision                FALSE      FALSE
## mentality_penalties             FALSE      FALSE
## mentality_composure             FALSE      FALSE
## defending_marking               FALSE      FALSE
## defending_standing_tackle       FALSE      FALSE
## defending_sliding_tackle        FALSE      FALSE
## 1 subsets of each size up to 8
## Selection Algorithm: forward
##          sofifa_id age height_cm weight_kg overall potential wage_eur
## 1  ( 1 ) " "       " " " "       " "       " "     " "       " "
## 2  ( 1 ) " "       " " " "       " "       " "     " "       " "
## 3  ( 1 ) " "       " " " "       " "       "*"     " "       " "
## 4  ( 1 ) " "       " " " "       " "       "*"     "*"       " "
## 5  ( 1 ) " "       " " " "       " "       "*"     "*"       " "
## 6  ( 1 ) " "       " " " "       " "       "*"     "*"       " "
## 7  ( 1 ) " "       " " " "       " "       "*"     "*"       "*"
## 8  ( 1 ) " "       "*" " "       " "       "*"     "*"       "*"
##          preferred_footRight international_reputation weak_foot
## 1  ( 1 ) " "                 " "                     " "
## 2  ( 1 ) " "                 "*"                     " "
## 3  ( 1 ) " "                 "*"                     " "
## 4  ( 1 ) " "                 "*"                     " "
## 5  ( 1 ) " "                 "*"                     " "
## 6  ( 1 ) " "                 "*"                     " "
## 7  ( 1 ) " "                 "*"                     " "
## 8  ( 1 ) " "                 "*"                     " "
##          skill_moves work_rateHigh/Low work_rateHigh/Medium
## 1  ( 1 ) " "         " "               " "
## 2  ( 1 ) " "         " "               " "
## 3  ( 1 ) " "         " "               " "
## 4  ( 1 ) " "         " "               " "
## 5  ( 1 ) " "         " "               " "
## 6  ( 1 ) " "         " "               " "
## 7  ( 1 ) " "         " "               " "
## 8  ( 1 ) " "         " "               " "
##          work_rateLow/High work_rateLow/Low work_rateLow/Medium
## 1  ( 1 ) " "               " "              " "
## 2  ( 1 ) " "               " "              " "
## 3  ( 1 ) " "               " "              " "
## 4  ( 1 ) " "               " "              " "
## 5  ( 1 ) " "               " "              " "
## 6  ( 1 ) " "               " "              " "
## 7  ( 1 ) " "               " "              " "
```

```
## 8  ( 1 ) " "                   " "                   " "
##           work_rateMedium/High work_rateMedium/Low work_rateMedium/Medium
## 1  ( 1 ) " "                   " "                 " "
## 2  ( 1 ) " "                   " "                 " "
## 3  ( 1 ) " "                   " "                 " "
## 4  ( 1 ) " "                   " "                 " "
## 5  ( 1 ) " "                   " "                 " "
## 6  ( 1 ) " "                   " "                 " "
## 7  ( 1 ) " "                   " "                 " "
## 8  ( 1 ) " "                   " "                 " "
##           release_clause_eur pace shooting passing dribbling defending
## 1  ( 1 ) "*"                " "  " "      " "     " "       " "
## 2  ( 1 ) "*"                " "  " "      " "     " "       " "
## 3  ( 1 ) "*"                " "  " "      " "     " "       " "
## 4  ( 1 ) "*"                " "  " "      " "     " "       " "
## 5  ( 1 ) "*"                " "  " "      " "     " "       " "
## 6  ( 1 ) "*"                " "  " "      " "     " "       " "
## 7  ( 1 ) "*"                " "  " "      " "     " "       " "
## 8  ( 1 ) "*"                " "  " "      " "     " "       " "
##           physic attacking_crossing attacking_finishing
## 1  ( 1 ) " "    " "                " "
## 2  ( 1 ) " "    " "                " "
## 3  ( 1 ) " "    " "                " "
## 4  ( 1 ) " "    " "                " "
## 5  ( 1 ) " "    " "                " "
## 6  ( 1 ) " "    " "                " "
## 7  ( 1 ) " "    " "                " "
## 8  ( 1 ) " "    " "                " "
##           attacking_heading_accuracy attacking_short_passing
## 1  ( 1 ) " "                        " "
## 2  ( 1 ) " "                        " "
## 3  ( 1 ) " "                        " "
## 4  ( 1 ) " "                        " "
## 5  ( 1 ) " "                        " "
## 6  ( 1 ) " "                        " "
## 7  ( 1 ) " "                        " "
## 8  ( 1 ) " "                        " "
##           attacking_volleys skill_dribbling skill_curve skill_fk_accuracy
## 1  ( 1 ) " "               " "             " "         " "
## 2  ( 1 ) " "               " "             " "         " "
## 3  ( 1 ) " "               " "             " "         " "
## 4  ( 1 ) " "               " "             " "         " "
## 5  ( 1 ) " "               " "             " "         " "
## 6  ( 1 ) " "               " "             " "         " "
## 7  ( 1 ) " "               " "             " "         " "
## 8  ( 1 ) " "               " "             " "         " "
##           skill_long_passing skill_ball_control movement_acceleration
## 1  ( 1 ) " "                " "                " "
## 2  ( 1 ) " "                " "                " "
## 3  ( 1 ) " "                " "                " "
## 4  ( 1 ) " "                " "                " "
## 5  ( 1 ) " "                " "                " "
## 6  ( 1 ) " "                " "                " "
## 7  ( 1 ) " "                " "                " "
```

```
## 8  ( 1 ) " "                    " "                    " "
##           movement_sprint_speed movement_agility movement_reactions
## 1  ( 1 ) " "                     " "              " "
## 2  ( 1 ) " "                     " "              " "
## 3  ( 1 ) " "                     " "              " "
## 4  ( 1 ) " "                     " "              " "
## 5  ( 1 ) " "                     " "              " "
## 6  ( 1 ) " "                     " "              " "
## 7  ( 1 ) " "                     " "              " "
## 8  ( 1 ) " "                     " "              " "
##           movement_balance power_shot_power power_jumping power_stamina
## 1  ( 1 ) " "              " "              " "           " "
## 2  ( 1 ) " "              " "              " "           " "
## 3  ( 1 ) " "              " "              " "           " "
## 4  ( 1 ) " "              " "              " "           " "
## 5  ( 1 ) " "              " "              " "           "*"
## 6  ( 1 ) " "              " "              " "           "*"
## 7  ( 1 ) " "              " "              " "           "*"
## 8  ( 1 ) " "              " "              " "           "*"
##           power_strength power_long_shots mentality_aggression
## 1  ( 1 ) " "            " "              " "
## 2  ( 1 ) " "            " "              " "
## 3  ( 1 ) " "            " "              " "
## 4  ( 1 ) " "            " "              " "
## 5  ( 1 ) " "            " "              " "
## 6  ( 1 ) " "            " "              " "
## 7  ( 1 ) " "            " "              " "
## 8  ( 1 ) " "            " "              " "
##           mentality_interceptions mentality_positioning mentality_vision
## 1  ( 1 ) " "                     " "                   " "
## 2  ( 1 ) " "                     " "                   " "
## 3  ( 1 ) " "                     " "                   " "
## 4  ( 1 ) " "                     " "                   " "
## 5  ( 1 ) " "                     " "                   " "
## 6  ( 1 ) " "                     " "                   " "
## 7  ( 1 ) " "                     " "                   " "
## 8  ( 1 ) " "                     " "                   " "
##           mentality_penalties mentality_composure defending_marking
## 1  ( 1 ) " "                 " "                 " "
## 2  ( 1 ) " "                 " "                 " "
## 3  ( 1 ) " "                 " "                 " "
## 4  ( 1 ) " "                 " "                 " "
## 5  ( 1 ) " "                 " "                 " "
## 6  ( 1 ) " "                 " "                 " "
## 7  ( 1 ) " "                 " "                 " "
## 8  ( 1 ) " "                 " "                 " "
##           defending_standing_tackle defending_sliding_tackle
## 1  ( 1 ) " "                       " "
## 2  ( 1 ) " "                       " "
## 3  ( 1 ) " "                       " "
## 4  ( 1 ) " "                       " "
## 5  ( 1 ) " "                       " "
## 6  ( 1 ) " "                       "*"
## 7  ( 1 ) " "                       "*"
```

```
## 8  ( 1 ) " "                          "*"
```

```r
par(mfrow=c(2,2))

plot(reg.summary$rss,xlab="Number of Variables",ylab="RSS",type="l")

plot(reg.summary$adjr2,xlab="Number of Variables",ylab="Adjusted RSq",type="l")
which.max(reg.summary$adjr2)
```

```
## [1] 8
```

```r
points(8,reg.summary$adjr2[8], col="red",cex=2,pch=20)

plot(reg.summary$cp,xlab="Number of Variables",ylab="Cp",type='l')
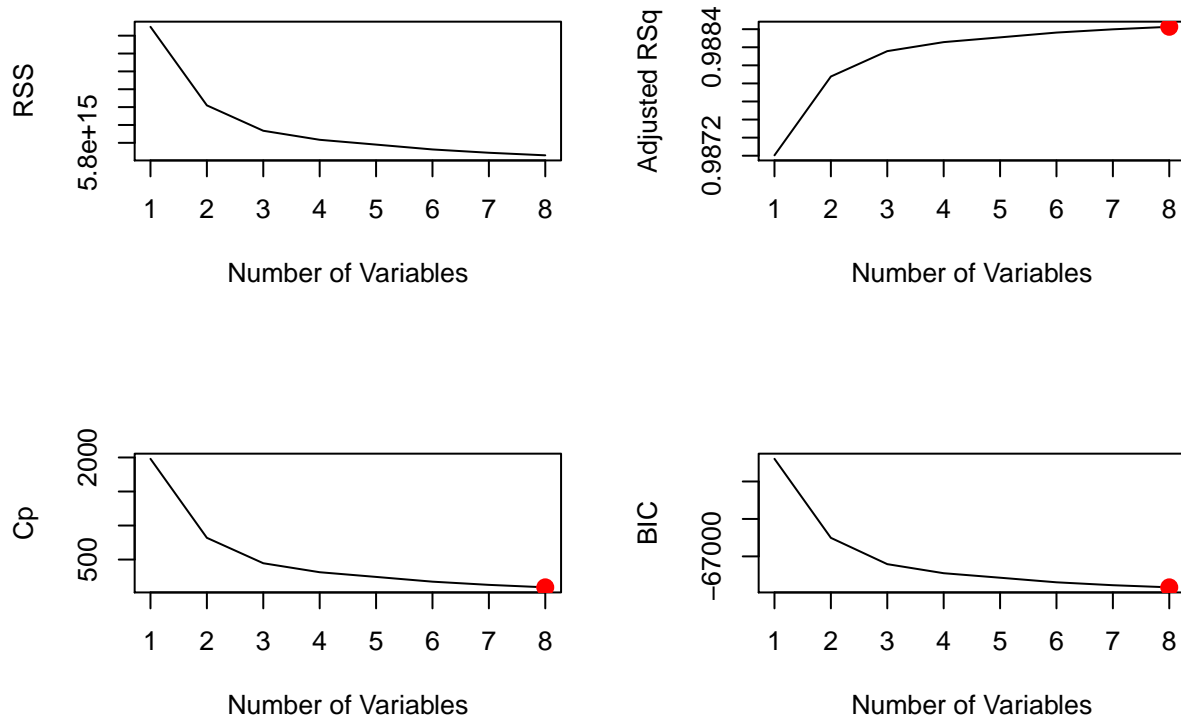which.min(reg.summary$cp)
```

```
## [1] 8
```

```r
points(8,reg.summary$cp[8],col="red",cex=2,pch=20)

which.min(reg.summary$bic)
```

```
## [1] 8
```

```r
plot(reg.summary$bic,xlab="Number of Variables",ylab="BIC",type='l')
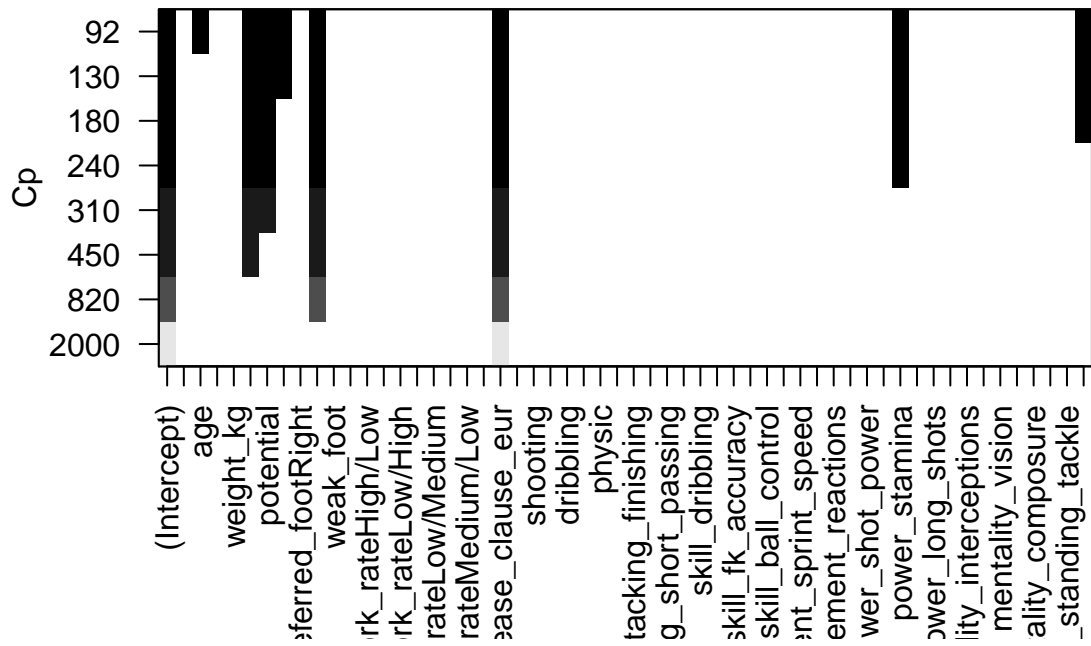points(8,reg.summary$bic[8],col="red",cex=2,pch=20)
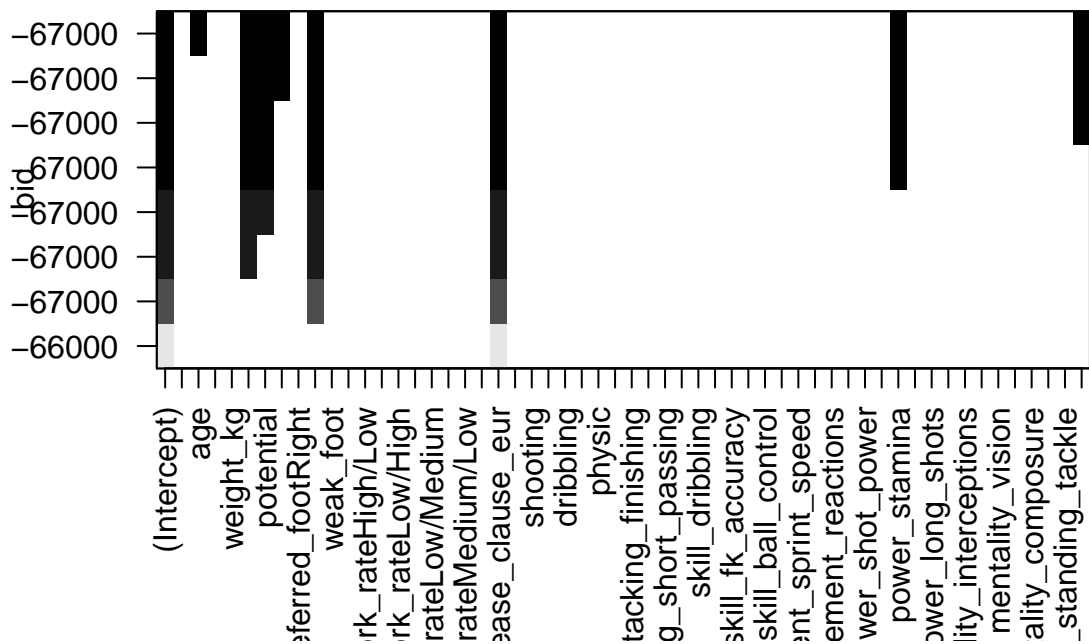```

```
plot(regfit.fwd,scale="r2")
```
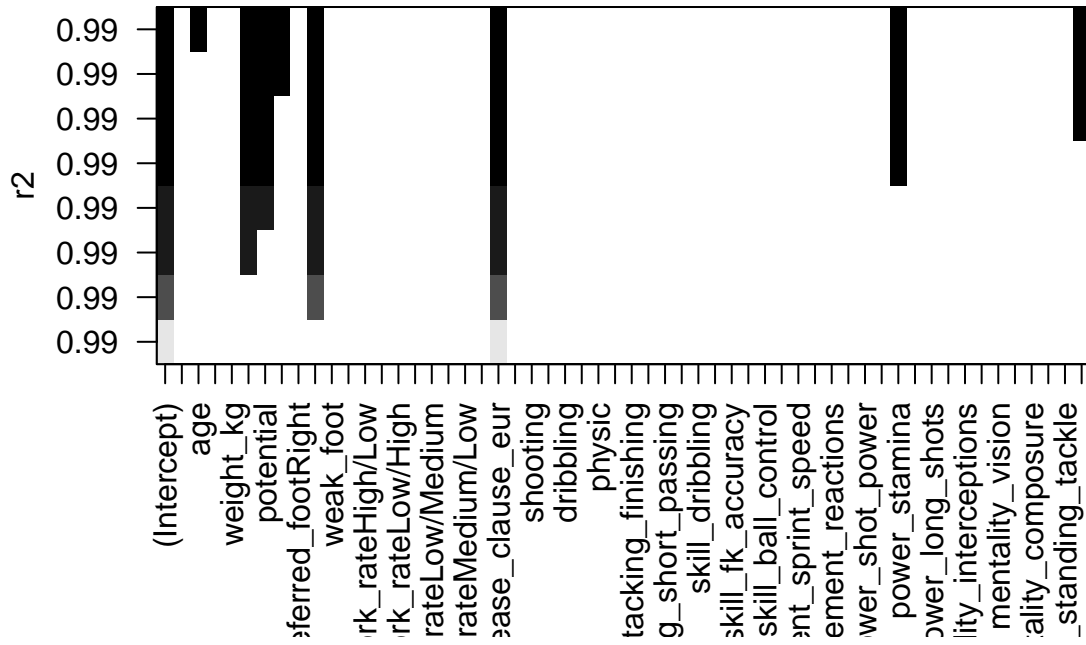


```
plot(regfit.fwd,scale="adjr2")
```
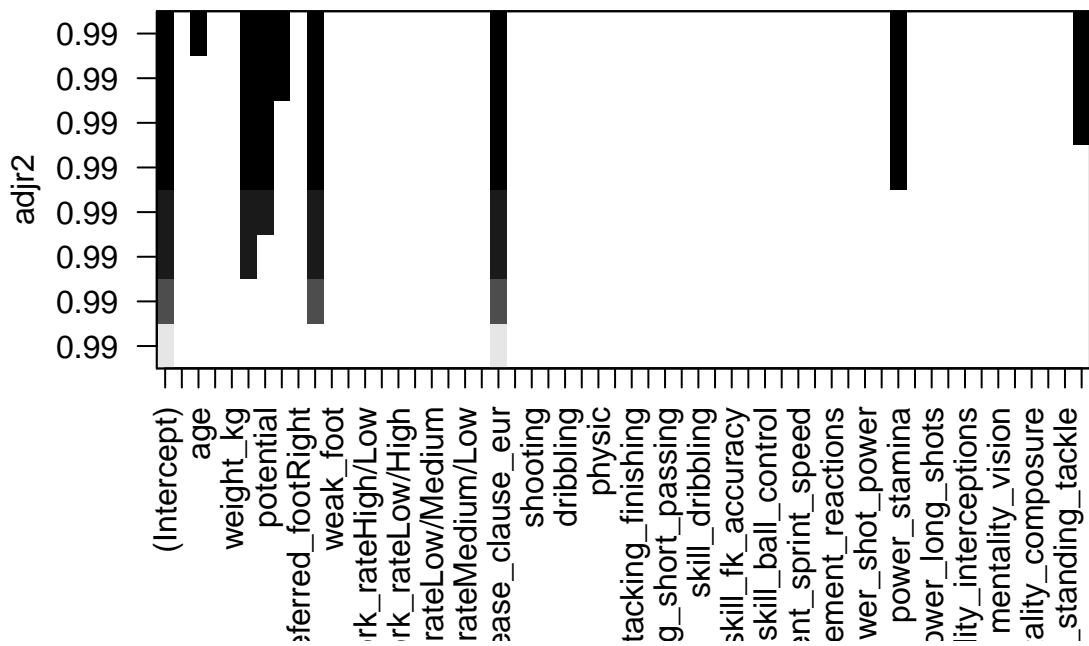
```
plot(regfit.fwd,scale="Cp")
```

```
plot(regfit.fwd,scale="bic")
```

```r
coef(regfit.fwd, 8)
```

```
##          (Intercept)                 age              overall
##        -7.374862e+05        -1.498995e+04         3.074348e+04
##            potential            wage_eur international_reputation
##        -2.130298e+04         3.320752e+00         5.062111e+05
##    release_clause_eur        power_stamina defending_sliding_tackle
##         4.935300e-01         4.779582e+03        -2.253148e+03
```