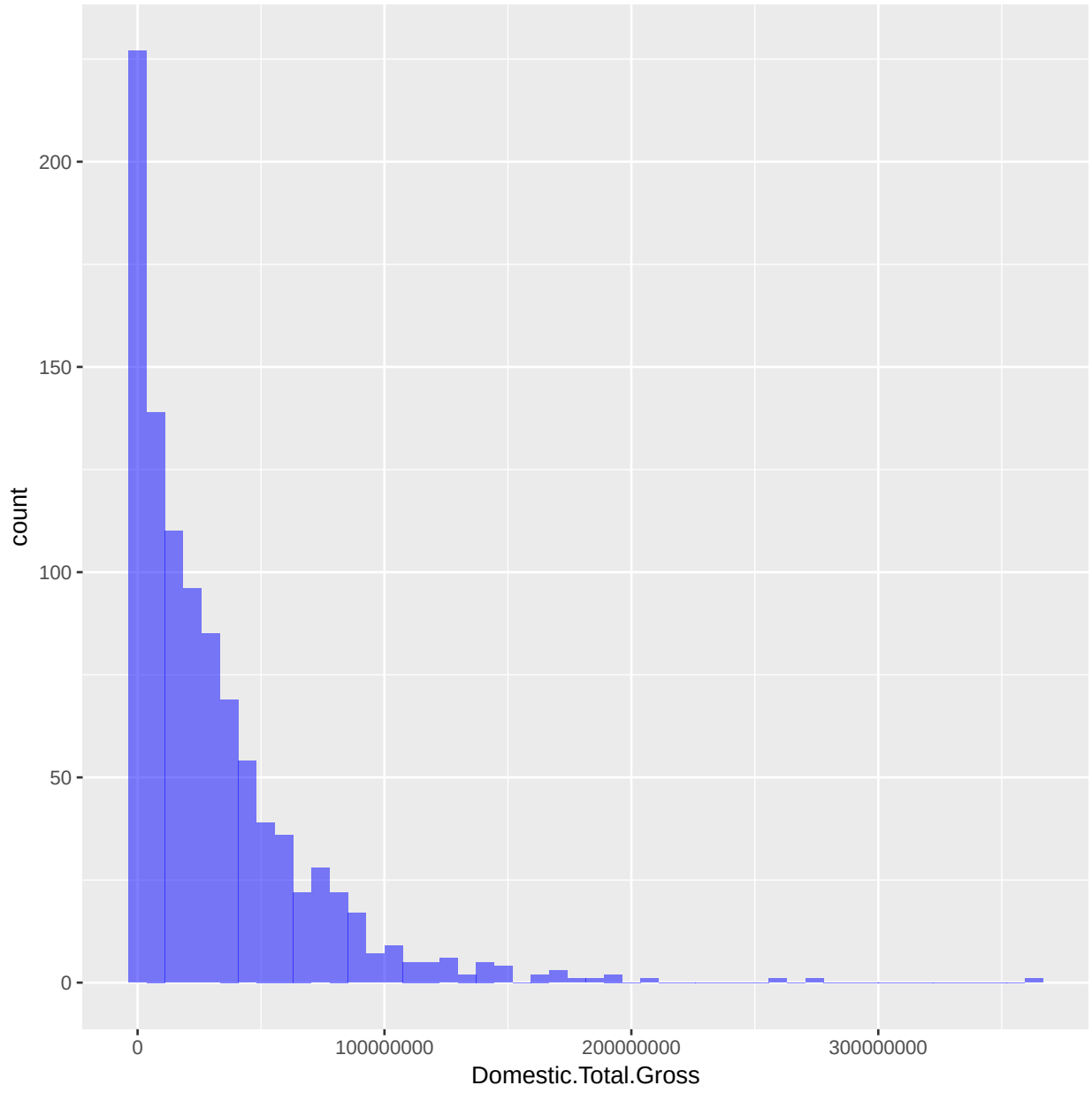
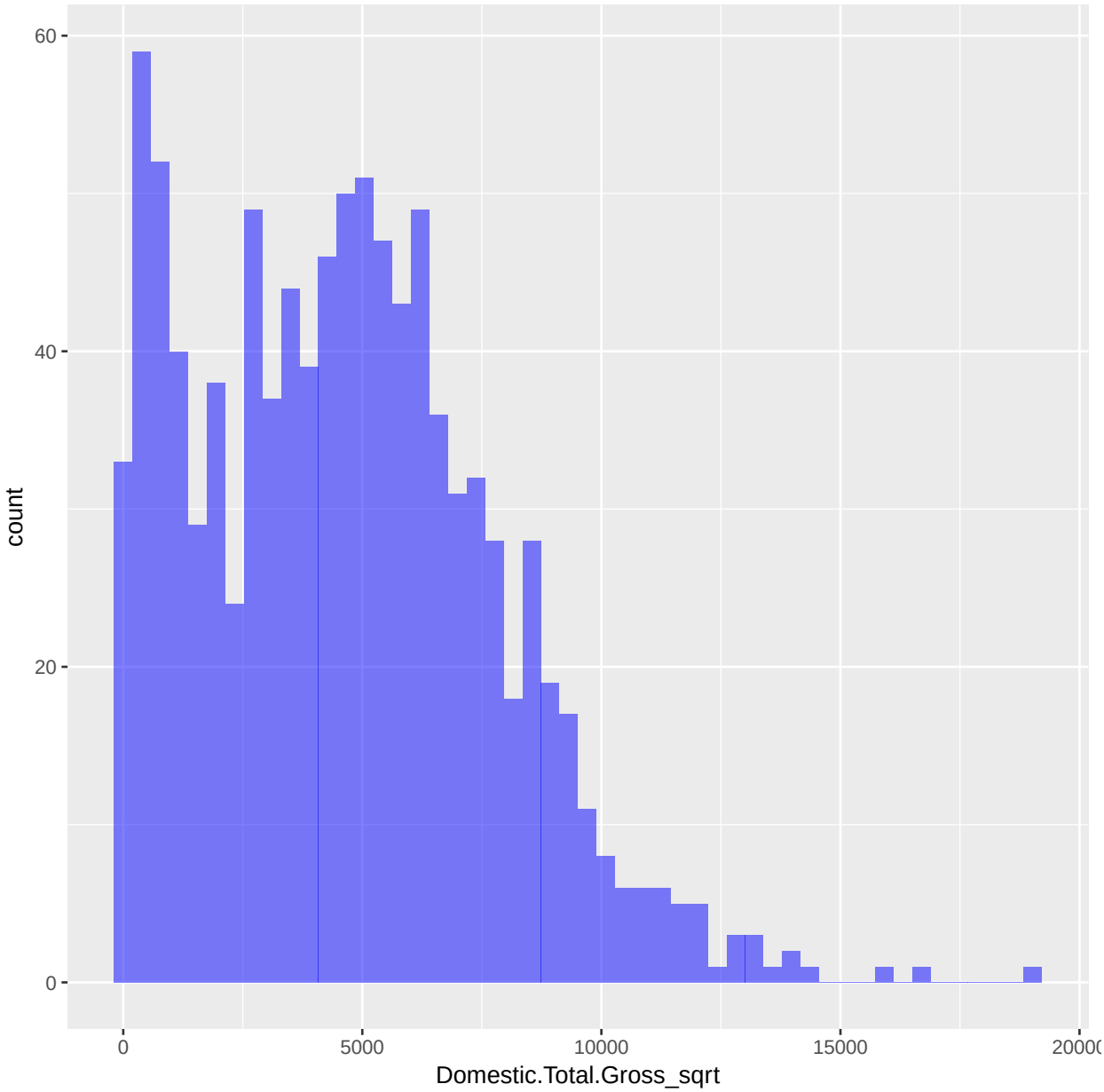
6242

Visualization of domestic total gross profit distribution.



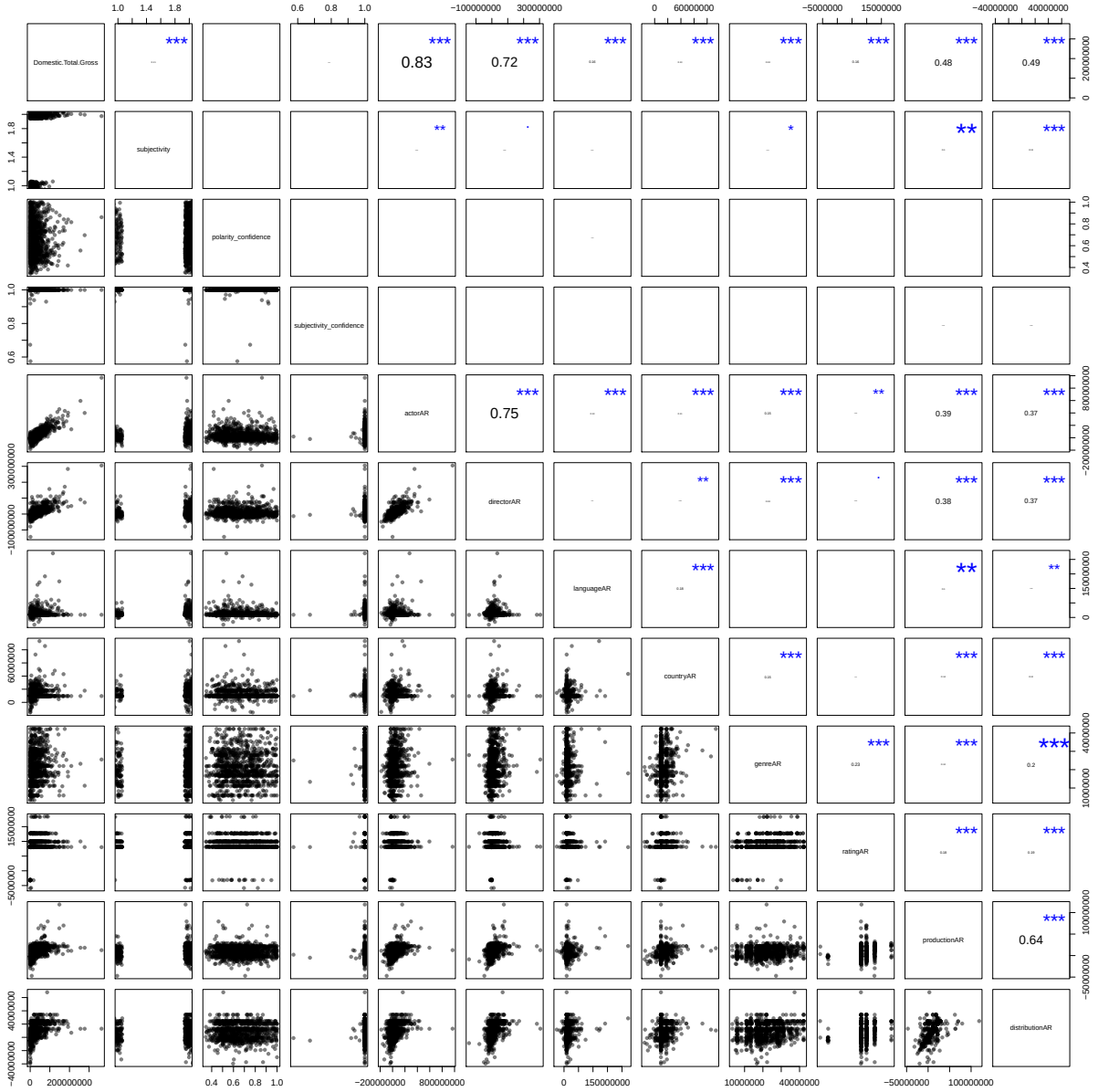
After applying square root transformation to make it less right skewed:



Here is the correlation matrix for all of the variables. Split into two for visibility, domestic total gross revenue is included in both. The variables with the highest correlation are budget and added revenue for actor, director, production, and distribution.

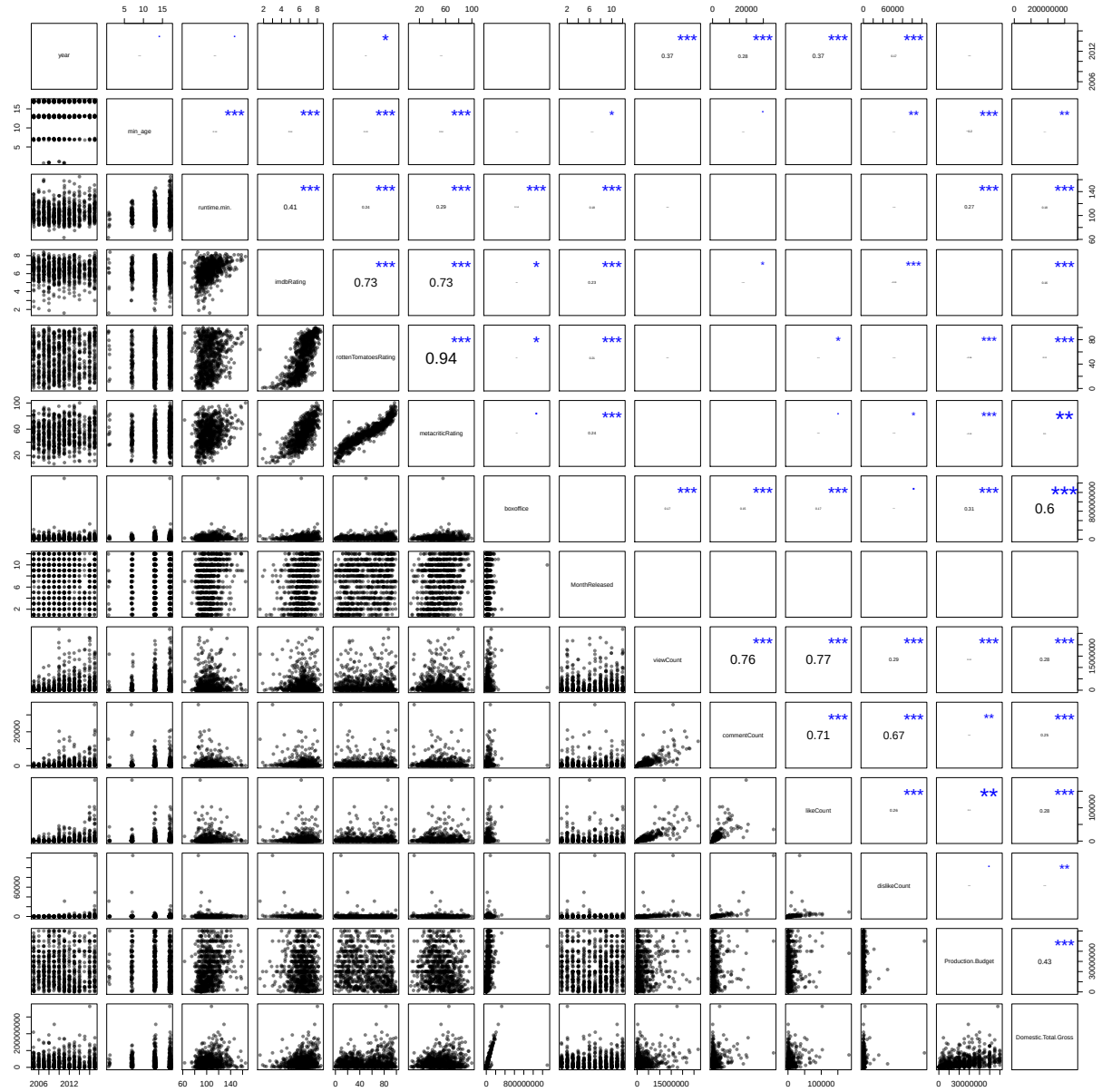
```
Correlation
Data     : outTrain
Method   : pearson
Variables: Domestic.Total.Gross, subjectivity, polarity_confidence, subjectivity_confidence, actorAR, di
Null hyp.: variables x and y are not correlated
Alt. hyp.: variables x and y are correlated

Correlation matrix:
                     Domestic.Total.Gross subjectivity polarity_confidence subjectivity_confidence ac
subjectivity              0.11
polarity_confidence      -0.01                -0.02
```

```
subjectivity_confidence  0.04                0.00        -0.02
actorAR                  0.83                0.09        -0.04                0.02
directorAR               0.72                0.06        -0.02                0.03                 0
languageAR               0.16                0.04        -0.04                0.01                 0
countryAR                0.13                0.04        -0.01               -0.00                 0
genreAR                  0.13                0.07         0.01                0.01                 0
ratingAR                 0.16               -0.02        -0.00                0.01                 0
productionAR             0.48                0.10        -0.02                0.04                 0
distributionAR           0.49                0.13        -0.02                0.05                 0

p.values:
                         Domestic.Total.Gross subjectivity polarity_confidence subjectivity_confidence a
subjectivity             0.00
polarity_confidence      0.79                0.56
subjectivity_confidence  0.21                0.95        0.51
actorAR                  0.00                0.00        0.26                 0.51
directorAR               0.00                0.05        0.46                 0.31                 0
languageAR               0.00                0.24        0.21                 0.66                 0
countryAR                0.00                0.26        0.65                 0.94                 0
genreAR                  0.00                0.02        0.72                 0.79                 0
ratingAR                 0.00                0.50        0.94                 0.79                 0
productionAR             0.00                0.00        0.56                 0.18                 0
distributionAR           0.00                0.00        0.46                 0.15                 0
```




```
Correlation
Data     : outTrain
Method   : pearson
Variables: year, min_age, runtime.min., imdbRating, rottenTomatoesRating, metacriticRating, boxoffice, l
Null hyp.: variables x and y are not correlated
Alt. hyp.: variables x and y are correlated

Correlation matrix:
                    year  min_age runtime.min. imdbRating rottenTomatoesRating metacriticRating boxoffi
min_age             0.06
runtime.min.        0.06  0.14
imdbRating         -0.03  0.14    0.41
rottenTomatoesRating  0.08  0.13    0.24         0.73
metacriticRating    0.05  0.14    0.29         0.73       0.94
```

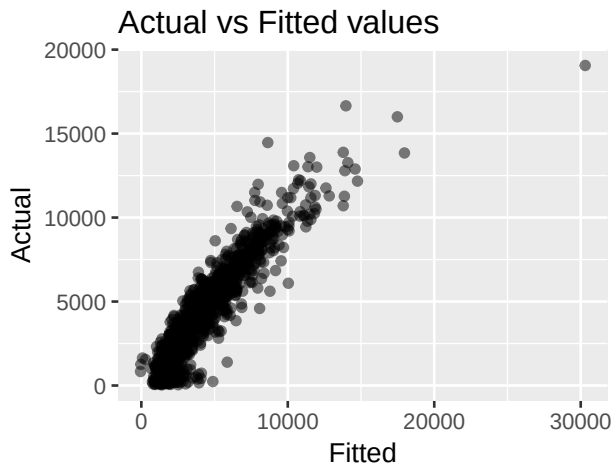
```
boxoffice             0.02 -0.05    0.14         0.09       0.07                 0.06
MonthReleased        -0.02  0.08    0.18         0.23       0.21                 0.24            0.03
viewCount             0.37  0.02    0.05        -0.01       0.04                 0.03            0.17
commentCount          0.28 -0.06   -0.02        -0.08       0.02                -0.00            0.15
likeCount             0.37 -0.02    0.01         0.03       0.08                 0.06            0.17
dislikeCount          0.17 -0.11   -0.05        -0.19      -0.05                -0.08            0.06
Production.Budget    -0.05 -0.20    0.27        -0.00      -0.16                -0.14            0.31
Domestic.Total.Gross  0.03 -0.11    0.18         0.16       0.13                 0.10            0.60

p.values:
                     year min_age runtime.min. imdbRating rottenTomatoesRating metacriticRating boxoffi
min_age              0.06
runtime.min.         0.07 0.00
imdbRating           0.40 0.00    0.00
rottenTomatoesRating 0.02 0.00    0.00         0.00
metacriticRating     0.15 0.00    0.00         0.00       0.00
boxoffice            0.63 0.14    0.00         0.01       0.05                 0.09
MonthReleased        0.52 0.03    0.00         0.00       0.00                 0.00            0.41
viewCount            0.00 0.50    0.17         0.89       0.23                 0.44            0.00
commentCount         0.00 0.09    0.49         0.02       0.63                 0.91            0.00
likeCount            0.00 0.52    0.68         0.45       0.03                 0.10            0.00
dislikeCount         0.00 0.00    0.12         0.00       0.12                 0.02            0.09
Production.Budget    0.13 0.00    0.00         0.93       0.00                 0.00            0.00
Domestic.Total.Gross 0.38 0.00    0.00         0.00       0.00                 0.00            0.00
```

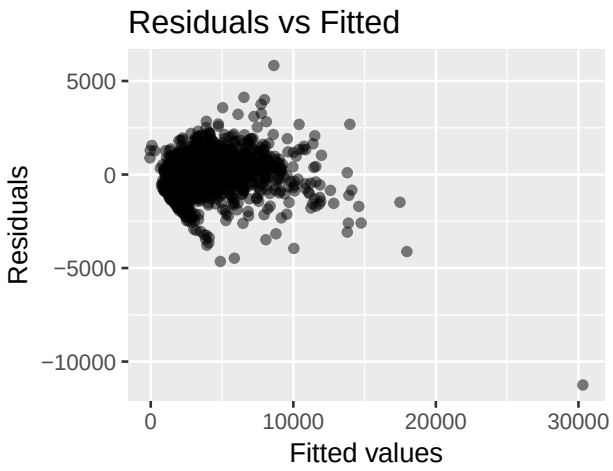


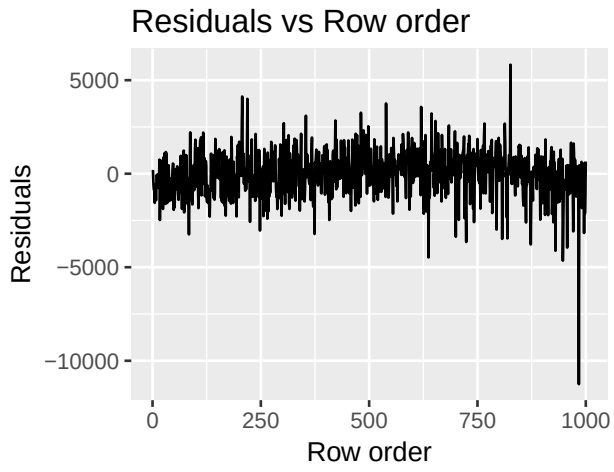
First model: Budget and added revenue for actor, director, production, and distribution. These variables had the highest correlation with domestic total gross revenue. I used the square root transformation, so when analyzing the test results I needed to square the results to get the actual prediction. Not that while the coefficients appear to be 0, they are not actually zero - it is just that the values for budget and added revenue are so large that a one unit change has a small effect.

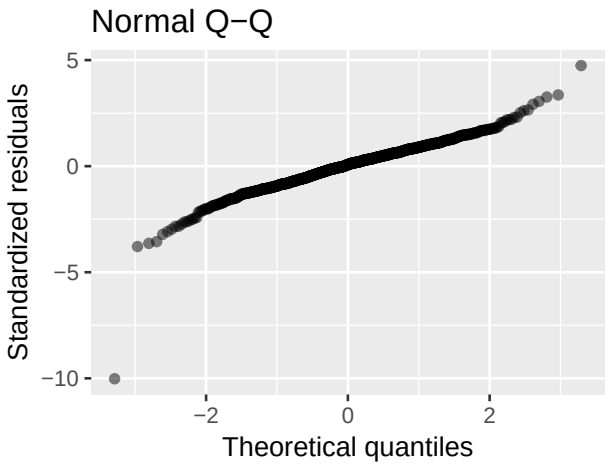
```
Linear regression (OLS)
Data     : outTrain
Response variable    : Domestic.Total.Gross_sqrt
Explanatory variables: Production.Budget, actorAR, directorAR, productionAR, distributionAR
Null hyp.: the effect of x on Domestic.Total.Gross_sqrt is zero
Alt. hyp.: the effect of x on Domestic.Total.Gross_sqrt is not zero

                  coefficient std.error t.value p.value
 (Intercept)          1472.040    69.355  21.225  < .001 ***
```

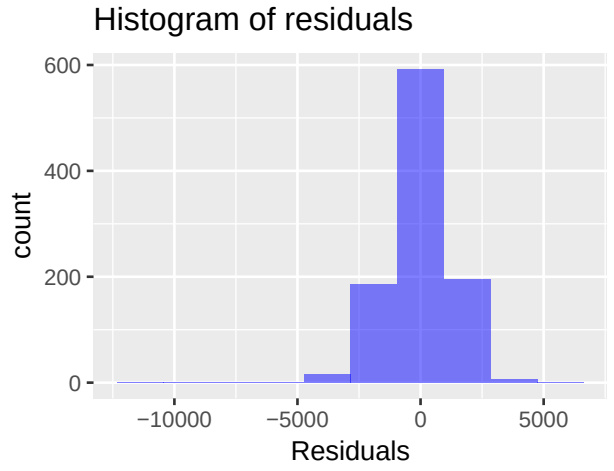
```
 Production.Budget       0.000     0.000  30.715  < .001 ***
 actorAR                 0.000     0.000  27.516  < .001 ***
 directorAR              0.000     0.000   7.773  < .001 ***
 productionAR            0.000     0.000   3.699  < .001 ***
 distributionAR          0.000     0.000   9.035  < .001 ***

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

R-squared: 0.841,  Adjusted R-squared: 0.841
F-statistic: 1054.272 df(5,994), p.value < .001
Nr obs: 1,000

Sum of squares:
            df         SS
Regression   5 8014114474
Error      994 1511190408
Total      999 9525304882

Variance Inflation Factors
    actorAR directorAR distributionAR productionAR Production.Budget
VIF   2.368      2.329          1.902        1.829             1.190
Rsq   0.578      0.571          0.474        0.453             0.159
```

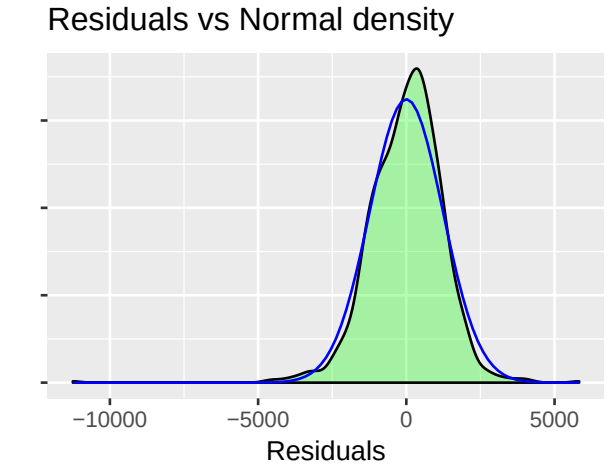








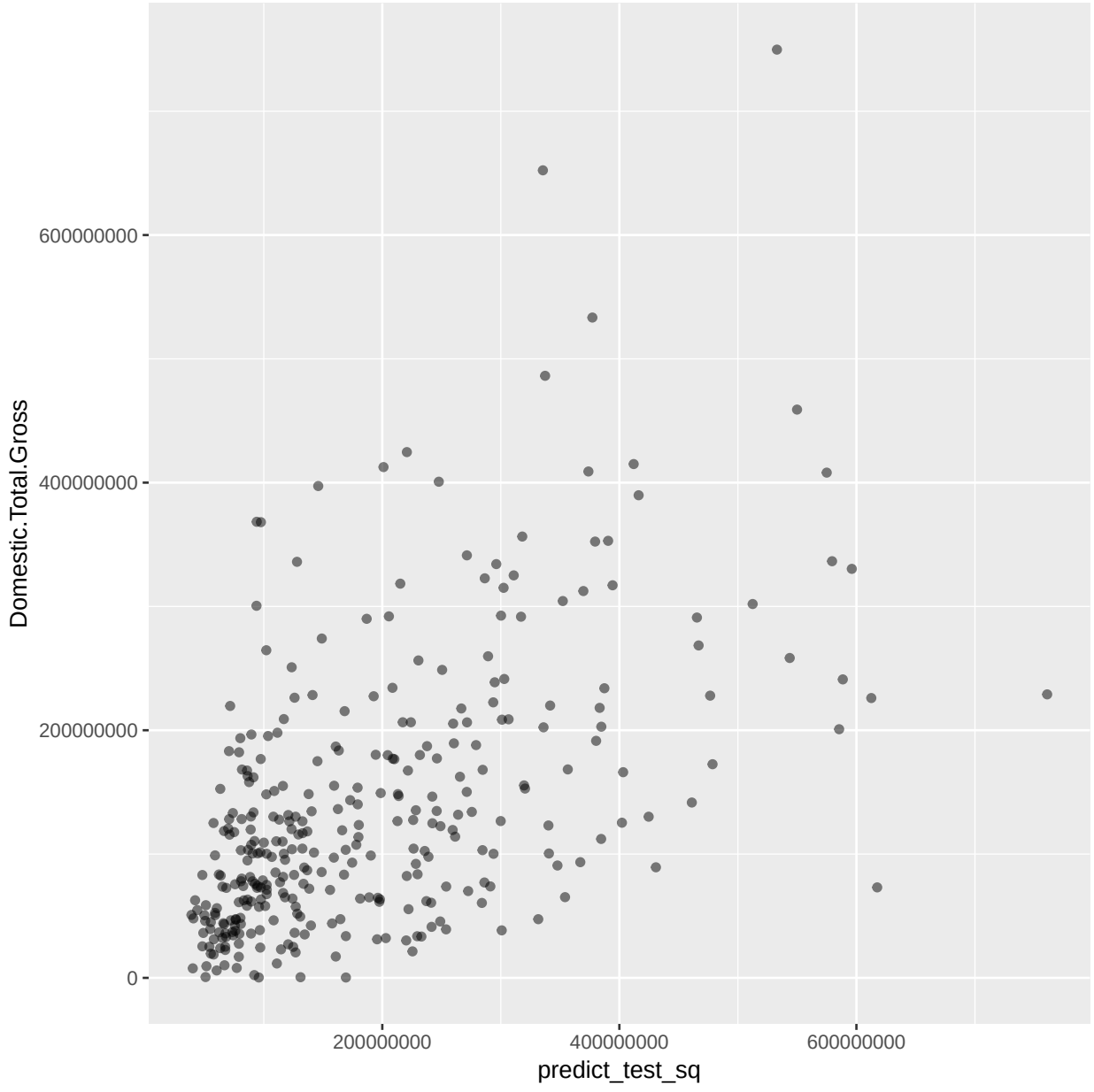





```
Linear regression (OLS)
Data                 : outTrain
Response variable    : Domestic.Total.Gross_sqrt
Explanatory variables: Production.Budget, actorAR, directorAR, productionAR, distributionAR
Prediction dataset   : outTest
Rows shown           : 10 of 332

 Production.Budget   actorAR directorAR productionAR distributionAR Prediction     2.5%     97.5%
```

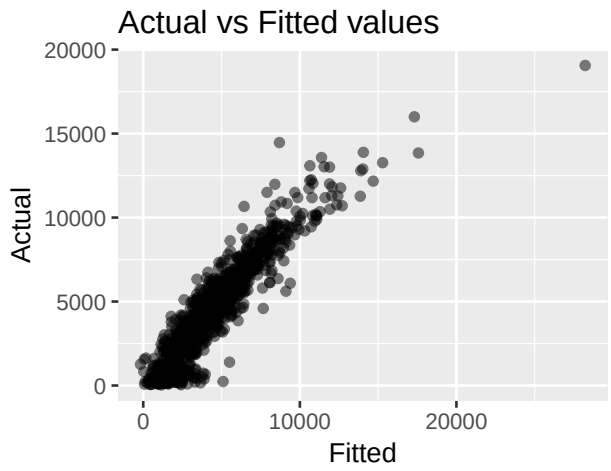
60000000	-15261663	30522105	-2697372	12943408	7112.322	4677.043	9547.600	2435.
60000000	0	0	21745046	20762074	7606.972	5178.518	10035.426	2428.
60000000	-4866478	-27365284	22280237	20132369	7070.807	4639.265	9502.349	2431.
60000000	-12636329	0	3463844	-395282	6245.271	3813.489	8677.054	2431.
60000000	-29182980	-14724554	17163082	10358090	6333.348	3903.537	8763.159	2429.
60000000	0	0	3463844	-395282	6487.643	4055.851	8919.435	2431.
60000000	-5875187	0	3463844	-395282	6374.954	3943.181	8806.726	2431.
60000000	20958976	16535902	-2697372	12943408	7589.556	5157.421	10021.690	2432.
60000000	-19997146	-3355187	22280237	20132369	7153.970	4725.014	9582.927	2428.
60000000	-8030088	0	21745046	20441134	7440.094	5011.517	9868.672	2428.

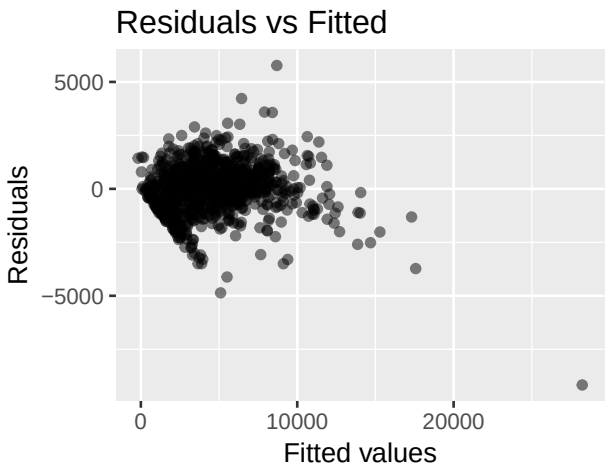
First model results - y axis is actual revenue and x axis is predicted revenue.

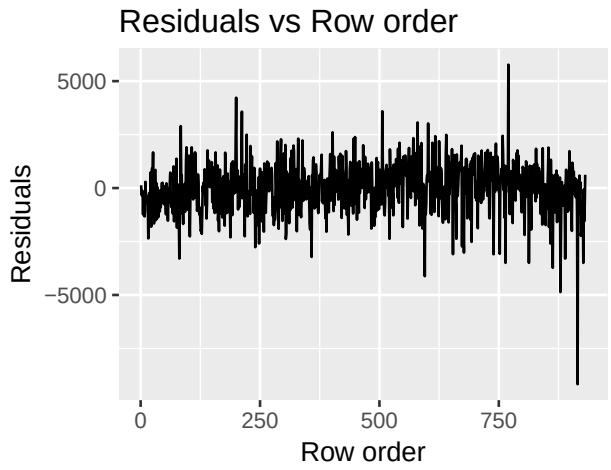


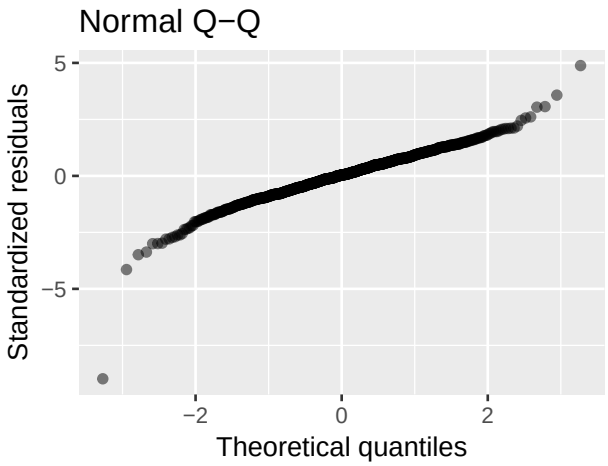
Second model: With all variables. Has a lower sum of squared error than the first model that had only 5 variables.

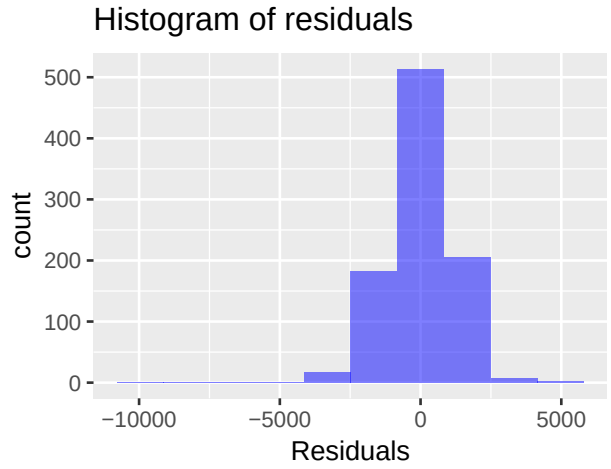
```
Linear regression (OLS)
Data     : outTrain
Response variable    : Domestic.Total.Gross_sqrt
Explanatory variables: rated, runtime.min., metacriticRating, YearReleased, MonthReleased, viewCount, c
Null hyp.: the effect of x on Domestic.Total.Gross_sqrt is zero
Alt. hyp.: the effect of x on Domestic.Total.Gross_sqrt is not zero

                         coefficient std.error t.value p.value
 (Intercept)               76438.639 24211.219   3.157   0.002 **
 rated|NC-17               -2051.053   937.980  -2.187   0.029 *
 rated|NOT RATED           -1456.918   486.119  -2.997   0.003 **
 rated|PG                   -324.013   402.191  -0.806   0.421
 rated|PG-13                -476.434   388.424  -1.227   0.220
 rated|R                    -755.464   387.827  -1.948   0.052 .
 runtime.min.                  7.847     3.058   2.566   0.010 *
 metacriticRating              8.798     2.478   3.551  < .001 ***
 YearReleased                -38.842    11.944  -3.252   0.001 **
 MonthReleased                -3.041    12.062  -0.252   0.801
 viewCount                     0.000     0.000   0.293   0.770
 commentCount                  0.100     0.035   2.837   0.005 **
 likeCount                    -0.015     0.005  -2.959   0.003 **
 dislikeCount                 -0.021     0.013  -1.620   0.105
 Production.Budget             0.000     0.000  25.974  < .001 ***
 polarity|neutral              3.313    96.776   0.034   0.973
 polarity|positive           -75.798   120.904  -0.627   0.531
 subjectivity|subjective    -119.455   121.475  -0.983   0.326
 polarity|_confidence          4.769   255.116   0.019   0.985
 subjectivity|_confidence   2403.933  2162.718   1.112   0.267
 actorAR                       0.000     0.000  25.181  < .001 ***
 directorAR                    0.000     0.000   8.233  < .001 ***
 languageAR                    0.000     0.000   1.503   0.133
 countryAR                     0.000     0.000   1.347   0.178
 genreAR                       0.000     0.000   1.766   0.078 .
 productionAR                  0.000     0.000   2.526   0.012 *
 distributionAR                0.000     0.000   9.526  < .001 ***

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

R-squared: 0.854,  Adjusted R-squared: 0.85
F-statistic: 203.838 df(26,904), p.value < .001
Nr obs: 931

The set of explanatory variables exhibit perfect multicollinearity.
One or more variables were dropped from the estimation.
Sum of squares:
            df         SS
Regression  26 7509453106
Error      904 1280909710
Total      930 8790362816

Multicollinearity diagnostics were not calculated.
```

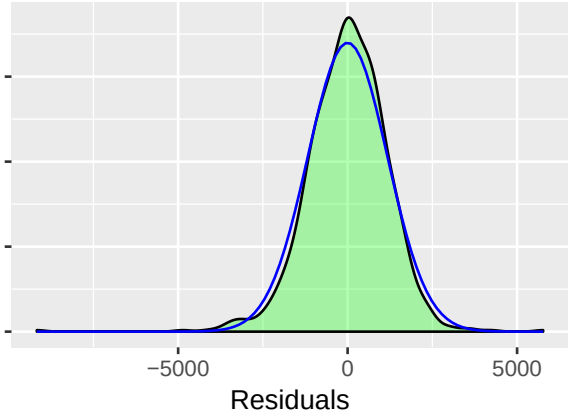










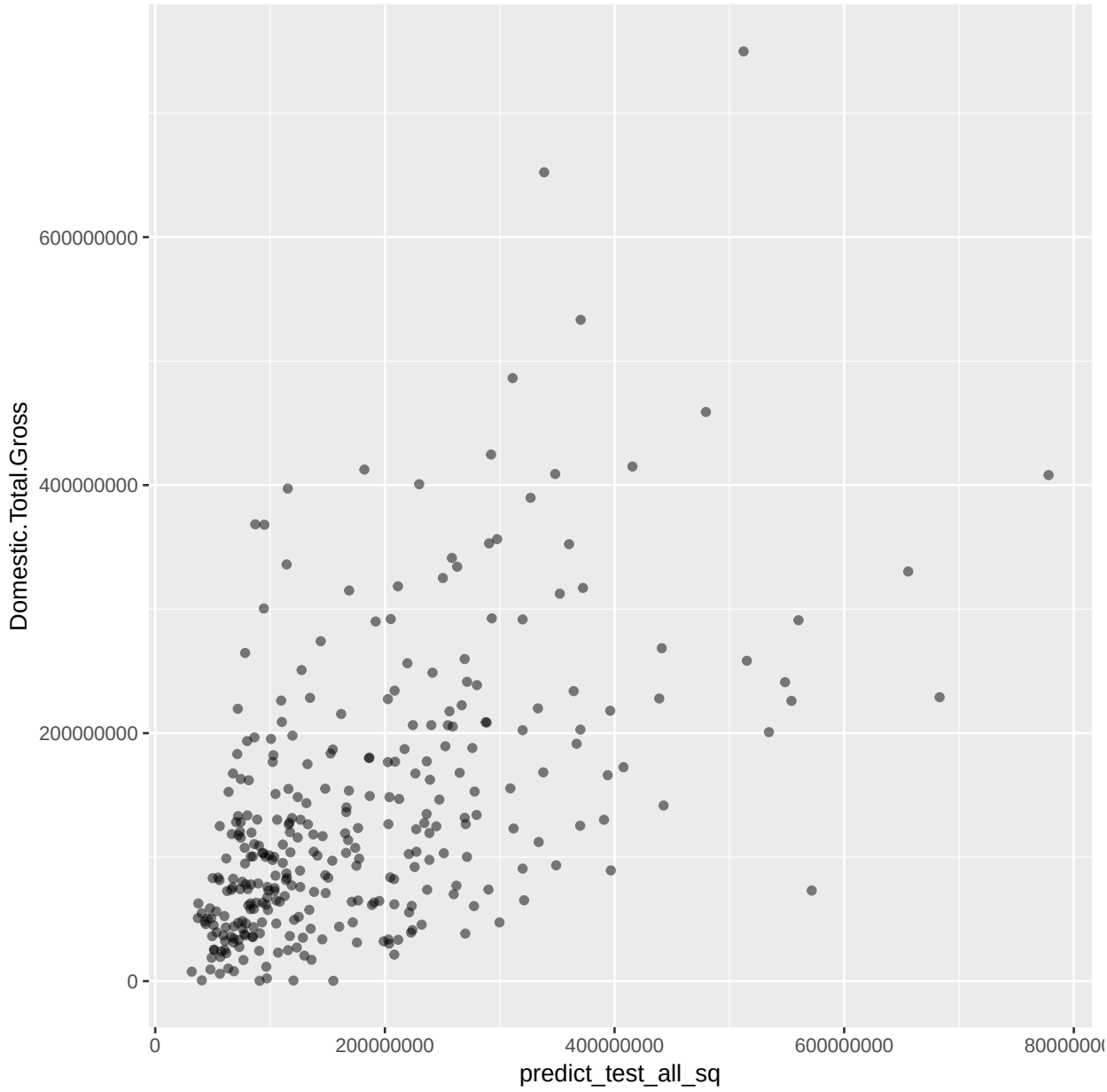



```
Linear regression (OLS)
Data                  : outTrain
Response variable     : Domestic.Total.Gross_sqrt
Explanatory variables: rated, runtime.min., metacriticRating, YearReleased, MonthReleased, viewCount, c
Prediction dataset    : outTest
Rows shown            : 10 of 317

 rated runtime.min. metacriticRating YearReleased MonthReleased    viewCount commentCount likeCount dis
```

R	113	40	2013	1	8778.000	4.000	23.000
PG-13	130	33	2013	8	6507433.000	11440.000	29867.000
PG-13	105	57	2014	1	150574.000	145.000	382.000
PG	96	61	2014	9	274261.000	169.000	1159.000
R	107	27	2015	1	4486055.000	885.000	9363.000
R	99	28	2016	3	1714519.000	1084.000	3003.000
PG	101	84	2016	8	6319206.000	3426.000	28815.000
PG-13	96	74	2016	9	14765703.000	8703.000	54735.000
PG-13	118	47	2016	10	125561.000	9.000	172.000
PG	90	40	2017	4	867614.000	392.000	1808.000

ratingAR	productionAR	distributionAR	Prediction	2.5%	97.5%	+/-
8133748	-2697372	12943408	6635.208	4272.145	8998.272	2363.063
9899276	21745046	20762074	8250.936	5827.047	10674.824	2423.889
9899276	22280237	20132369	6753.973	4380.987	9126.959	2372.986
12706625	3463844	-395282	6096.868	3724.595	8469.142	2372.274
8133748	17163082	10358090	5636.303	3263.281	8009.326	2373.023
8133748	3463844	-395282	6127.905	3722.119	8533.692	2405.786
12706625	3463844	-395282	6568.314	4179.568	8957.059	2388.746
9899276	-2697372	12943408	7495.798	5097.871	9893.724	2397.926
9899276	22280237	20132369	6903.025	4545.253	9260.797	2357.772
12706625	21745046	20441134	7133.263	4749.182	9517.344	2384.081

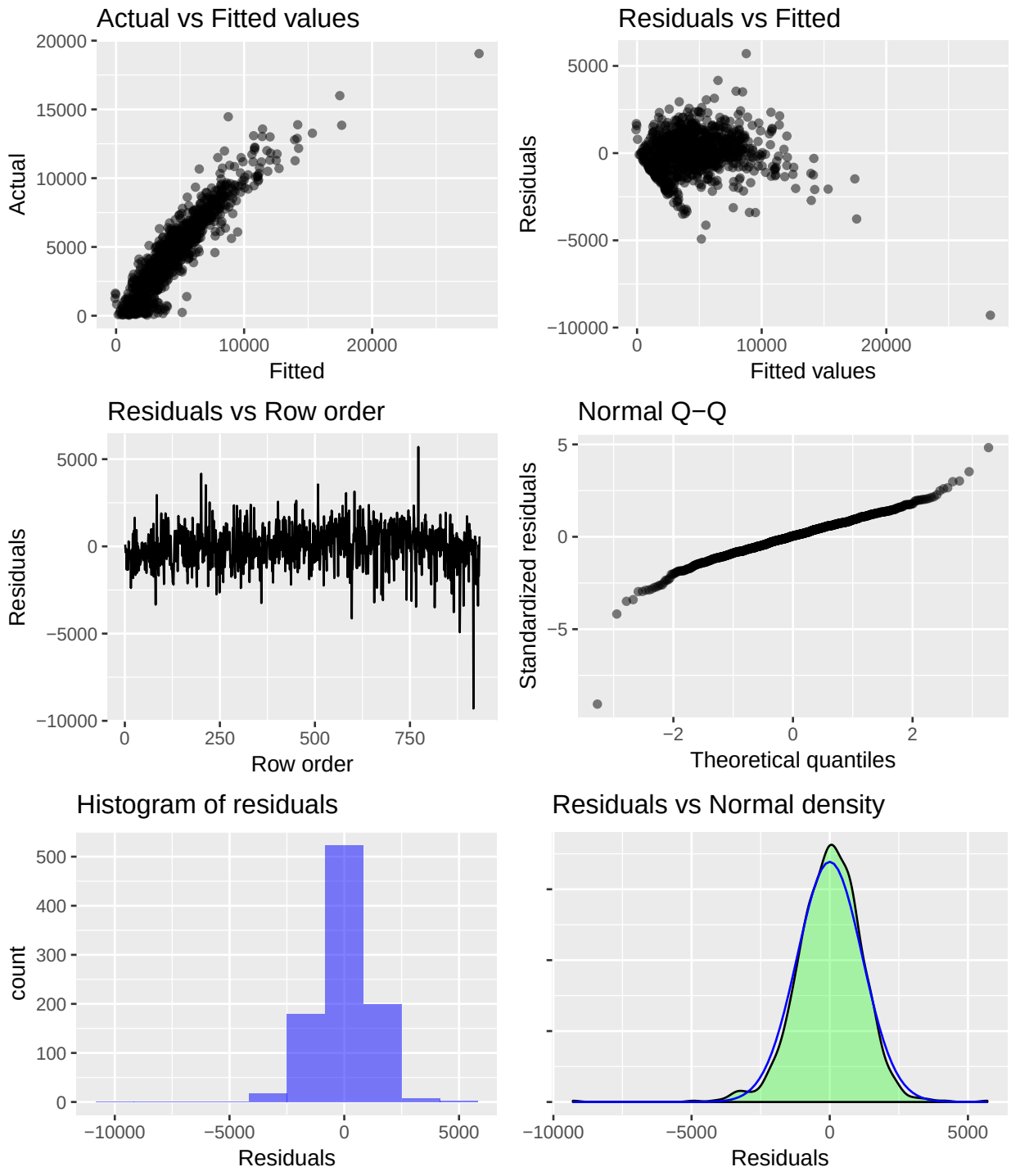
Here is a scatterplot comparing on the y axis the actual revenue and the x axis the predicted revenue for the second model.



This third model has the variables from the second model with the insignificant variables removed. The sum of squared error is slightly higher than the second model, however now all of the variables are at least significant at alpha = 0.1

```
Linear regression (OLS)
Data     : outTrain
Response variable    : Domestic.Total.Gross_sqrt
Explanatory variables: rated, min_age, runtime.min., metacriticRating, YearReleased, commentCount, like
Null hyp.: the effect of x on Domestic.Total.Gross_sqrt is zero
Alt. hyp.: the effect of x on Domestic.Total.Gross_sqrt is not zero

                  coefficient std.error t.value p.value
 (Intercept)        77404.388 23095.053   3.352  < .001 ***
 rated|NC-17        -2028.808   930.314  -2.181   0.029 *
 rated|NOT RATED    -1431.888   483.564  -2.961   0.003 **
```

```
 rated|PG             -332.156   400.240  -0.830   0.407
 rated|PG-13         -449.088   386.663  -1.161   0.246
 rated|R             -725.869   385.482  -1.883   0.060 .
 runtime.min.           8.092     3.024   2.676   0.008 **
 metacriticRating       9.157     2.392   3.827  < .001 ***
 YearReleased         -38.177    11.495  -3.321  < .001 ***
 commentCount           0.108     0.030   3.602  < .001 ***
 likeCount             -0.014     0.005  -3.168   0.002 **
 dislikeCount          -0.023     0.012  -1.850   0.065 .
 Production.Budget      0.000     0.000  26.641  < .001 ***
 actorAR                0.000     0.000  26.080  < .001 ***
 directorAR             0.000     0.000   8.144  < .001 ***
 genreAR                0.000     0.000   1.991   0.047 *
 productionAR           0.000     0.000   2.674   0.008 **
 distributionAR         0.000     0.000   9.510  < .001 ***

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

R-squared: 0.853,  Adjusted R-squared: 0.85
F-statistic: 312.512 df(17,915), p.value < .001
Nr obs: 933

The set of explanatory variables exhibit perfect multicollinearity.
One or more variables were dropped from the estimation.
Sum of squares:
            df         SS
Regression  17 7507084779
Error      915 1292934278
Total      932 8800019056

Multicollinearity diagnostics were not calculated.
```




```
Linear regression (OLS)
Data                 : outTrain
Response variable    : Domestic.Total.Gross_sqrt
Explanatory variables: rated, min_age, runtime.min., metacriticRating, YearReleased, commentCount, like
Prediction dataset   : outTest
Rows shown           : 10 of 318

 rated min_age runtime.min. metacriticRating YearReleased commentCount likeCount dislikeCount Productio
```

R	17	113	40	2013	4.000	23.000	1.000	
PG-13	13	130	33	2013	11440.000	29867.000	1042.000	
PG-13	13	105	57	2014	145.000	382.000	63.000	
PG	7	96	61	2014	169.000	1159.000	42.000	
R	17	107	27	2015	885.000	9363.000	527.000	
R	17	99	28	2016	1084.000	3003.000	347.000	
PG	7	101	84	2016	3426.000	28815.000	1522.000	
PG-13	13	96	74	2016	8703.000	54735.000	2057.000	
PG-13	13	118	47	2016	9.000	172.000	7.000	
PG	7	90	40	2017	392.000	1808.000	327.000	

Finally, a scatterplot of the predictions for this third model with the actual revenue for the testing data.