

```

library(car)

## Loading required package: carData

library(reshape2)
library(ggplot2)
library(MASS)
library(interactions)

source("clean_data.R")

df <- remove_cols(df, c("Color", "Model"))

# Remove columns with only one observation and affected rows
res <- convert_categorical(df, categorical)
design <- as.data.frame(res$dummy)

singles <- c()
bad_idx <- c()
for (col in colnames(design)) {
  if (sum(design[, col] != 0) <= 1) {
    singles <- c(singles, col)
    bad_idx <- c(bad_idx, which(design[, col] != 0))
  }
}
singles

## [1] "MakeFiat" "MakeLexus" "Fuel.TypePetrol + CNG"
## [4] "LocationDak. Kannada" "LocationFaizabad" "LocationGorakhpur"
## [7] "LocationPurnea" "LocationRohtak" "LocationRudrapur"
## [10] "LocationSamastipur" "LocationValsad"

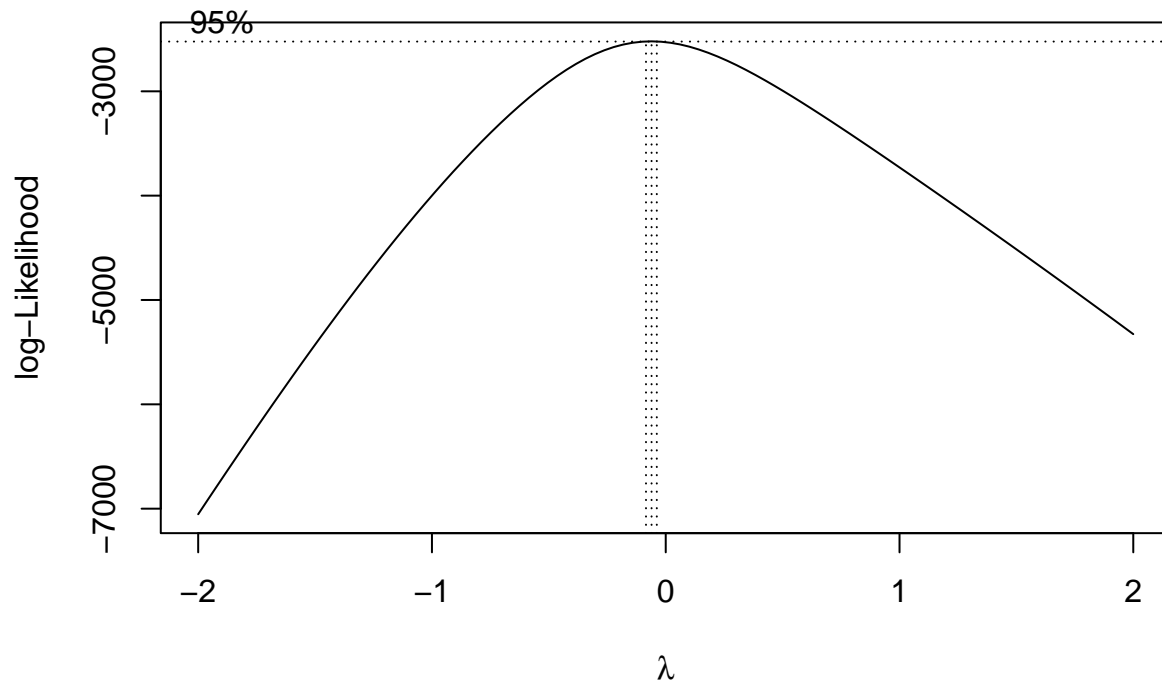
bad_idx

## [1] 662 1009 1169 1077 779 569 728 245 510 264 162
df <- df[-bad_idx, ]

```

Box Cox

```
bc <- boxcox(Price ~., data = df)
```



```
bc$x[which.max(bc$y)]
```

```
## [1] -0.06060606
```

For the sake of interpretability, we will use a log transformation, since $\lambda \approx 0$.

Iteratively Remove Multicollinear Regressors

```
x <- df
model <- lm(log(Price) ~., data = x)
removed <- c()

finished <- F
while(!finished) {
  temp <- car::vif(model)[, "GVIF^(1/(2*Df))"]
  worst <- names(which.max(temp))
  if (length(temp) > 0 && temp[worst] > sqrt(5)) {
    x <- remove_cols(x, c(worst))
    model <- lm(log(Price) ~., data = x)

    removed <- c(removed, worst)
  } else {
    finished <- T
  }
}

removed

## [1] "Max.Torque.Value" "Max.Power.RPM" "Max.Power.Value"
## [4] "Engine" "Fuel.Tank.Capacity" "Height"
which(abs(rstudent(model)) > 4)

## 44 366 492 1536 1681
```

```
## 39 268 345 1071 1171
```

After inspecting these data points, we do not find a good reason to remove them (i.e., they are not clerical errors).

Add Interactions

We consider only numerical interactions due to data sparsity; including categorical values produces NA's for most interactions. We do not expect kilometers driven to interact with torque or width, so those interactions are not considered.

```
names(model$coefficients)[names(model$coefficients) %in% numerical]
```

```
## [1] "Year"          "Kilometer"      "Max.Torque.RPM" "Length"
## [5] "Width"
```

```
model <- lm(
  log(Price) ~ . + Year:Kilometer + Year:Max.Torque.RPM
              + Year:Length + Year:Width
              + Max.Torque.RPM:Length + Max.Torque.RPM:Width
              + Length:Width,
  data = x
)

anova(model)
```

```
## Analysis of Variance Table
```

```
##
```

```
## Response: log(Price)
```

```
##              Df Sum Sq Mean Sq  F value    Pr(>F)
## Make           25 354.44   14.178   482.1594 < 2.2e-16 ***
## Year            1 178.52  178.525  6071.3552 < 2.2e-16 ***
## Kilometer       1   0.98   0.982    33.3800 9.430e-09 ***
## Fuel.Type       2  19.23   9.615    326.9979 < 2.2e-16 ***
## Transmission    1  20.31  20.313    690.7982 < 2.2e-16 ***
## Location        63  16.76   0.266     9.0458 < 2.2e-16 ***
## Owner           3   0.46   0.153     5.2143 0.001397 **
## Seller.Type      2   0.33   0.165     5.6238 0.003697 **
## Max.Torque.RPM   1   1.67   1.669    56.7628 9.050e-14 ***
## Drivetrain       2   5.81   2.905    98.7875 < 2.2e-16 ***
## Length          1  51.72  51.724  1759.0668 < 2.2e-16 ***
## Width           1   5.06   5.063    172.1998 < 2.2e-16 ***
## Seating.Capacity 1   0.02   0.019     0.6507 0.419991
## Year:Kilometer   1   1.10   1.100    37.4187 1.251e-09 ***
## Year:Max.Torque.RPM 1   0.99   0.993    33.7868 7.690e-09 ***
## Year:Length      1   2.04   2.038    69.2926 < 2.2e-16 ***
## Year:Width       1   0.08   0.076     2.5959 0.107377
## Max.Torque.RPM:Length 1   0.28   0.276     9.3872 0.002229 **
## Max.Torque.RPM:Width 1   0.01   0.012     0.3960 0.529287
## Length:Width     1   0.01   0.014     0.4748 0.490893
## Residuals      1329  39.08   0.029
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Interactions with width don't seem to be significant; remove them.

```
model <- lm(
  log(Price) ~ . + Year:Kilometer + Year:Max.Torque.RPM
              + Year:Length + Max.Torque.RPM:Length,
  data = x
)
```

```
anova(model)
```

```
## Analysis of Variance Table
```

```
##
```

```
## Response: log(Price)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
## Make	25	354.44	14.178	481.9160	< 2.2e-16 ***
## Year	1	178.52	178.525	6068.2914	< 2.2e-16 ***
## Kilometer	1	0.98	0.982	33.3632	9.505e-09 ***
## Fuel.Type	2	19.23	9.615	326.8329	< 2.2e-16 ***
## Transmission	1	20.31	20.313	690.4496	< 2.2e-16 ***
## Location	63	16.76	0.266	9.0412	< 2.2e-16 ***
## Owner	3	0.46	0.153	5.2117	0.001402 **
## Seller.Type	2	0.33	0.165	5.6210	0.003708 **
## Max.Torque.RPM	1	1.67	1.669	56.7341	9.165e-14 ***
## Drivetrain	2	5.81	2.905	98.7377	< 2.2e-16 ***
## Length	1	51.72	51.724	1758.1791	< 2.2e-16 ***
## Width	1	5.06	5.063	172.1129	< 2.2e-16 ***
## Seating.Capacity	1	0.02	0.019	0.6504	0.420108
## Year:Kilometer	1	1.10	1.100	37.3998	1.262e-09 ***
## Year:Max.Torque.RPM	1	0.99	0.993	33.7697	7.752e-09 ***
## Year:Length	1	2.04	2.038	69.2576	< 2.2e-16 ***
## Max.Torque.RPM:Length	1	0.27	0.270	9.1768	0.002498 **
## Residuals	1332	39.19	0.029		

```
## ---
```

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

Seems reasonable now. We will double check our assumptions

```
vif(model, type = "predictor")
```

```
## GVIFs computed for predictors
```

	GVIF	Df	GVIF ^{1/(2*Df)}
## Make	119.109068	25	1.100320
## Year	75.935730	8	1.310774
## Kilometer	330.635985	3	2.629612
## Fuel.Type	5.334325	2	1.519742
## Transmission	1.851632	1	1.360747
## Location	16.448508	63	1.022473
## Owner	1.673586	3	1.089619
## Seller.Type	1.341372	2	1.076186
## Max.Torque.RPM	207.518246	6	1.559869
## Drivetrain	4.003689	2	1.414539
## Length	207.518246	6	1.559869
## Width	4.624641	1	2.150498
## Seating.Capacity	2.882982	1	1.697934
##			Interacts With
## Make			--

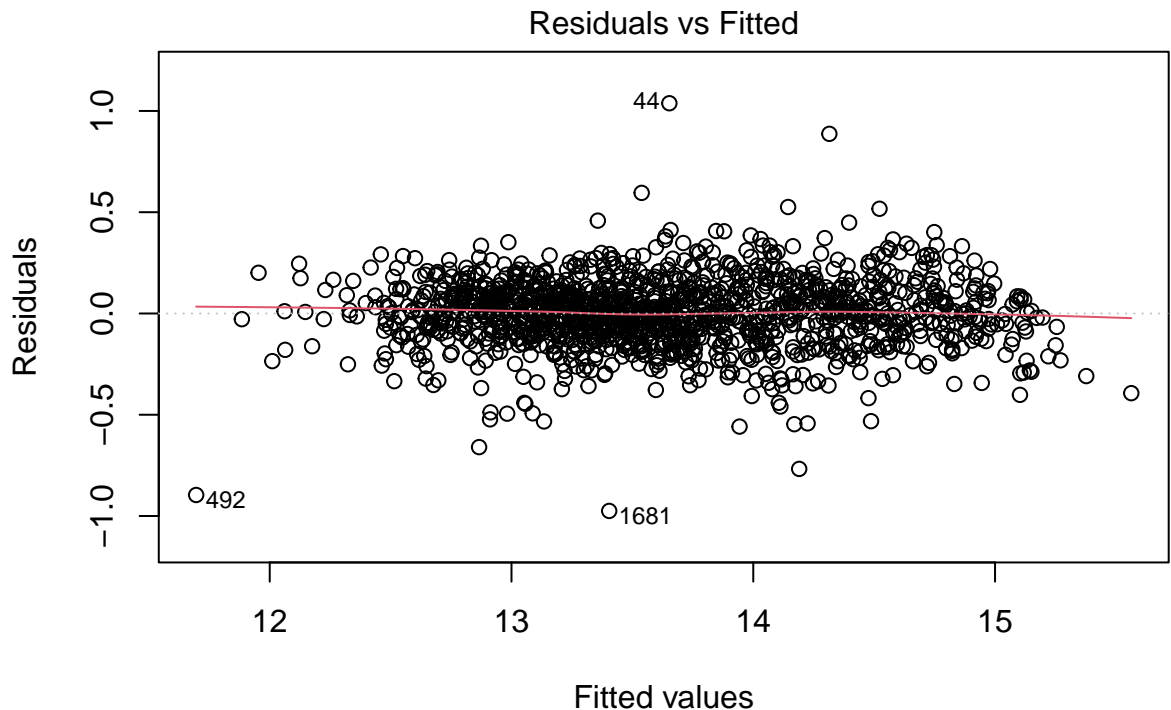
```

## Year          Kilometer, Max.Torque.RPM, Length
## Kilometer          Year
## Fuel.Type          --
## Transmission          --
## Location          --
## Owner          --
## Seller.Type          --
## Max.Torque.RPM          Year, Length
## Drivetrain          --
## Length          Year, Max.Torque.RPM
## Width          --
## Seating.Capacity          --
##
## Make          Year, Kilometer, Fuel.Type, Transmission, Location, Owner, Seller.Type, Max.Torque.RPM
## Year          Make, Fuel.Type, Transmission, Location, Owner, Seller.Type, Max.Torque.RPM
## Kilometer          Make, Fuel.Type, Transmission, Location, Owner, Seller.Type, Max.Torque.RPM
## Fuel.Type          Make, Year, Kilometer, Transmission, Location, Owner, Seller.Type, Max.Torque.RPM
## Transmission          Make, Year, Kilometer, Fuel.Type, Location, Owner, Seller.Type, Max.Torque.RPM
## Location          Make, Year, Kilometer, Fuel.Type, Transmission, Owner, Seller.Type, Max.Torque.RPM
## Owner          Make, Year, Kilometer, Fuel.Type, Transmission, Location, Seller.Type, Max.Torque.RPM
## Seller.Type          Make, Year, Kilometer, Fuel.Type, Transmission, Location, Owner, Max.Torque.RPM
## Max.Torque.RPM          Make, Kilometer, Fuel.Type, Transmission, Location, Owner, Seller.Type, Max.Torque.RPM
## Drivetrain          Make, Year, Kilometer, Fuel.Type, Transmission, Location, Owner, Seller.Type, Max.Torque.RPM
## Length          Make, Kilometer, Fuel.Type, Transmission, Location, Owner, Seller.Type, Max.Torque.RPM
## Width          Make, Year, Kilometer, Fuel.Type, Transmission, Location, Owner, Seller.Type, Max.Torque.RPM
## Seating.Capacity          Make, Year, Kilometer, Fuel.Type, Transmission, Location, Owner, Seller.Type, Max.Torque.RPM

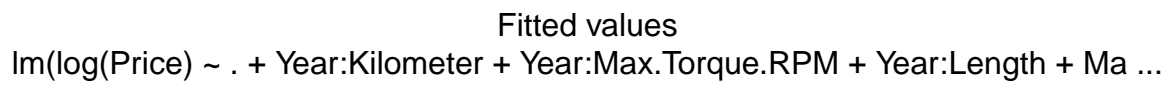
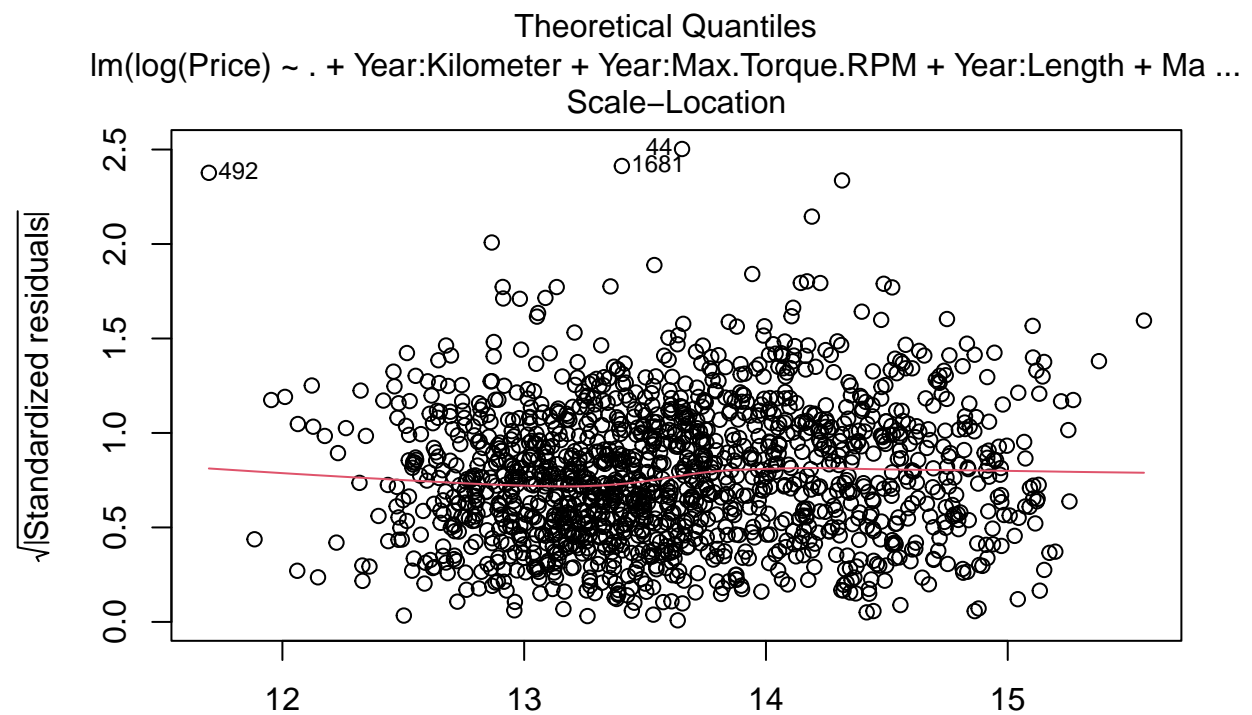
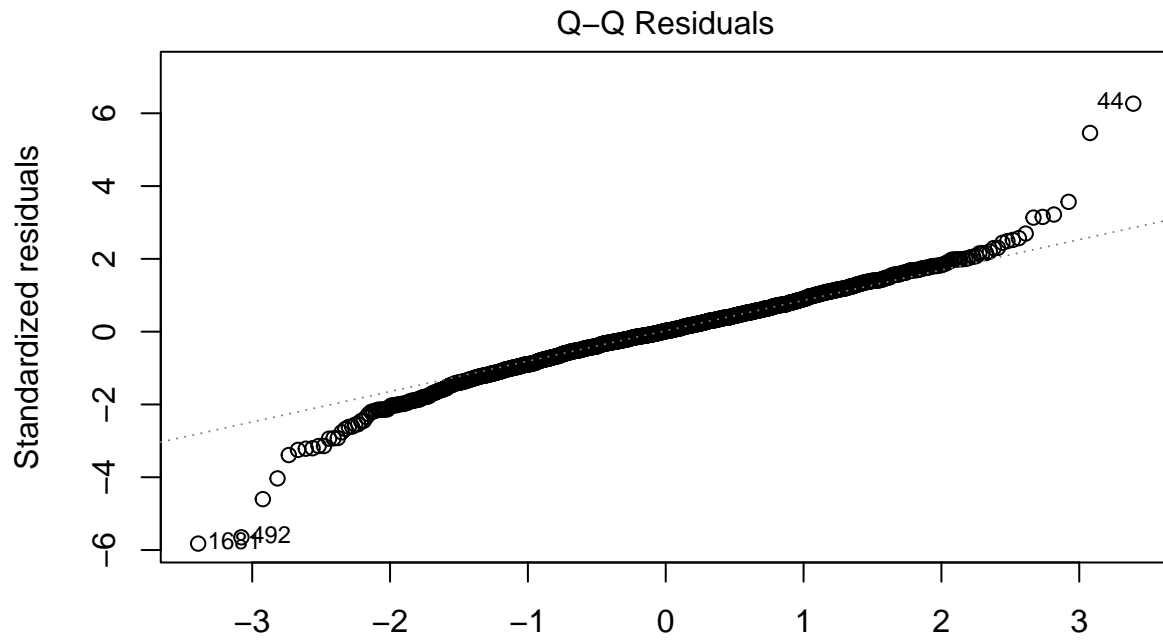
```

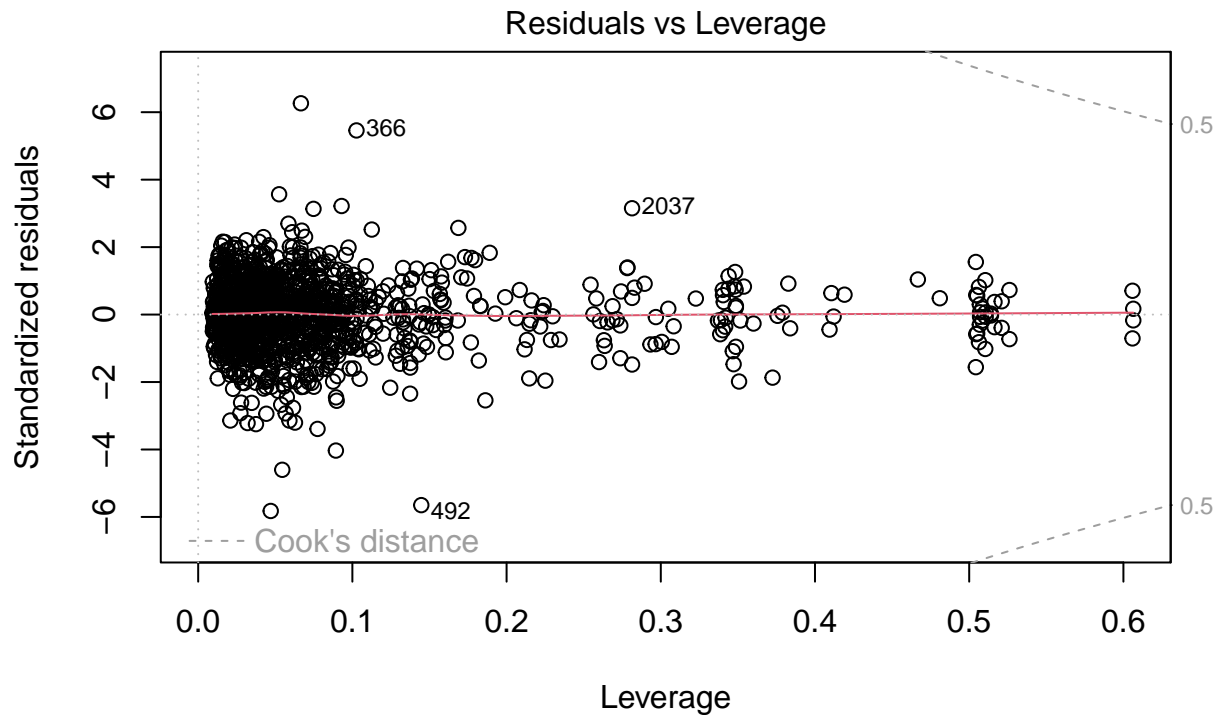
We get that $GVIF^{(1/(2 \cdot Df))} > 2.236068 \approx \sqrt{5}$, for “Kilometer,” but this is known to be important is does not exceed the threshold by a lot, so we keep it.

```
plot(model)
```



$\text{lm}(\log(\text{Price}) \sim . + \text{Year}:\text{Kilometer} + \text{Year}:\text{Max.Torque.RPM} + \text{Year}:\text{Length} + \text{Ma} \dots)$





lm(log(Price) ~ . + Year:Kilometer + Year:Max.Torque.RPM + Year:Length + Ma ...

Backwards Stepwise Search

We do a backwards search since our model already conforms to the linear assumptions and is performing well. We simply wish to reduce the model size now.

```
reduced_model <- step(model, direction = "backward", data = x, trace = 0)
old <- names(model$coefficients)
new <- names(reduced_model$coefficients)

old[!(old %in% new)]

## [1] "Seller.TypeCorporate" "Seller.TypeIndividual" "Seating.Capacity"
```

Inspect Model Coefficients

```
summary(reduced_model)

##
## Call:
## lm(formula = log(Price) ~ Make + Year + Kilometer + Fuel.Type +
##     Transmission + Location + Owner + Max.Torque.RPM + Drivetrain +
##     Length + Width + Year:Kilometer + Year:Max.Torque.RPM + Year:Length +
##     Max.Torque.RPM:Length, data = x)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.96723 -0.09029  0.00315  0.09727  1.06985
##
## Coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
```

## (Intercept)	1.158e+02	4.324e+01	2.678	0.007494	**
## MakeBMW	1.267e-02	4.002e-02	0.317	0.751541	
## MakeChevrolet	-7.982e-01	9.078e-02	-8.793	< 2e-16	***
## MakeDatsun	-8.571e-01	6.913e-02	-12.399	< 2e-16	***
## MakeFord	-5.727e-01	3.836e-02	-14.932	< 2e-16	***
## MakeHonda	-4.859e-01	3.120e-02	-15.573	< 2e-16	***
## MakeHyundai	-4.650e-01	2.736e-02	-16.996	< 2e-16	***
## MakeIsuzu	-4.377e-01	1.275e-01	-3.433	0.000616	***
## MakeJaguar	6.590e-02	7.679e-02	0.858	0.390958	
## MakeJeep	-3.336e-01	5.056e-02	-6.598	6.01e-11	***
## MakeKia	-4.155e-01	4.444e-02	-9.350	< 2e-16	***
## MakeLand Rover	1.808e-01	1.027e-01	1.761	0.078472	.
## MakeMahindra	-5.963e-01	3.300e-02	-18.072	< 2e-16	***
## MakeMaruti Suzuki	-5.232e-01	2.813e-02	-18.599	< 2e-16	***
## MakeMercedes-Benz	1.454e-01	3.286e-02	4.426	1.04e-05	***
## MakeMG	-5.963e-01	5.491e-02	-10.861	< 2e-16	***
## MakeMINI	7.041e-01	7.573e-02	9.297	< 2e-16	***
## MakeMitsubishi	-2.496e-01	1.123e-01	-2.223	0.026365	*
## MakeNissan	-7.334e-01	5.153e-02	-14.232	< 2e-16	***
## MakeRenault	-7.493e-01	3.845e-02	-19.484	< 2e-16	***
## MakeSkoda	-5.091e-01	3.729e-02	-13.652	< 2e-16	***
## MakeSsangyong	-8.725e-01	1.130e-01	-7.719	2.29e-14	***
## MakeTata	-7.190e-01	3.690e-02	-19.485	< 2e-16	***
## MakeToyota	-2.488e-01	2.997e-02	-8.304	2.44e-16	***
## MakeVolkswagen	-5.183e-01	3.755e-02	-13.803	< 2e-16	***
## MakeVolvo	3.094e-02	5.612e-02	0.551	0.581532	
## Year	-5.295e-02	2.144e-02	-2.470	0.013648	*
## Kilometer	-4.525e-04	1.205e-04	-3.755	0.000181	***
## Fuel.TypeDiesel	-1.647e-01	3.761e-02	-4.378	1.29e-05	***
## Fuel.TypePetrol	-1.895e-01	3.407e-02	-5.561	3.24e-08	***
## TransmissionManual	-1.439e-01	1.264e-02	-11.384	< 2e-16	***
## LocationAhmedabad	6.225e-02	4.846e-02	1.284	0.199240	
## LocationAllahabad	-9.060e-02	1.081e-01	-0.838	0.401922	
## LocationAmbala Cantt	-9.213e-02	6.973e-02	-1.321	0.186672	
## LocationAmritsar	1.218e-01	9.740e-02	1.251	0.211326	
## LocationAurangabad	2.931e-01	1.082e-01	2.710	0.006818	**
## LocationBangalore	2.465e-01	4.583e-02	5.379	8.84e-08	***
## LocationBhopal	2.905e-02	1.085e-01	0.268	0.788928	
## LocationBhubaneswar	8.012e-02	1.126e-01	0.711	0.476905	
## LocationBulandshahar	-3.137e-01	1.311e-01	-2.392	0.016889	*
## LocationChandigarh	3.183e-02	6.192e-02	0.514	0.607355	
## LocationChennai	2.161e-01	5.086e-02	4.248	2.30e-05	***
## LocationCoimbatore	2.694e-01	5.931e-02	4.542	6.07e-06	***
## LocationDehradun	5.931e-02	5.817e-02	1.019	0.308151	
## LocationDelhi	7.161e-02	4.396e-02	1.629	0.103563	
## LocationDharwad	2.073e-01	1.289e-01	1.609	0.107889	
## LocationErnakulam	2.090e-01	1.296e-01	1.613	0.106954	
## LocationFaridabad	-6.976e-02	5.634e-02	-1.238	0.215806	
## LocationGhaziabad	-2.308e-02	1.298e-01	-0.178	0.858964	
## LocationGoa	2.481e-01	9.789e-02	2.534	0.011380	*
## LocationGurgaon	-1.028e-02	5.621e-02	-0.183	0.854956	
## LocationGuwahati	1.672e-01	8.915e-02	1.875	0.060970	.
## LocationHaldwani	-1.095e-02	1.292e-01	-0.085	0.932493	
## LocationHyderabad	1.855e-01	4.650e-02	3.990	6.97e-05	***


```

## LocationIndore      2.097e-01  9.657e-02  2.172 0.030046 *
## LocationJaipur      1.230e-01  5.472e-02  2.247 0.024785 *
## LocationJalandhar   1.812e-01  5.766e-02  3.143 0.001708 **
## LocationJamshedpur  -1.725e-02  8.972e-02 -0.192 0.847533
## LocationKanpur      -8.606e-02  5.155e-02 -1.669 0.095280 .
## LocationKarnal      9.667e-02  7.439e-02  1.299 0.194010
## LocationKharar      5.630e-02  1.293e-01  0.435 0.663336
## LocationKheda       -8.822e-02  1.289e-01 -0.684 0.493901
## LocationKolkata     -7.600e-02  4.854e-02 -1.566 0.117611
## LocationKollam      2.268e-01  1.292e-01  1.755 0.079410 .
## LocationKota        1.171e-01  1.409e-01  0.831 0.405932
## LocationLucknow     2.163e-02  4.870e-02  0.444 0.656920
## LocationLudhiana    4.327e-02  5.132e-02  0.843 0.399288
## LocationMangalore   5.662e-02  9.648e-02  0.587 0.557384
## LocationMeerut      3.854e-02  7.468e-02  0.516 0.605902
## LocationMirzapur    9.829e-02  1.402e-01  0.701 0.483506
## LocationMohali      1.159e-01  5.559e-02  2.086 0.037195 *
## LocationMumbai      1.007e-01  4.387e-02  2.295 0.021871 *
## LocationMuzaffarpur -6.818e-02  1.290e-01 -0.528 0.597330
## LocationMysore      3.209e-01  7.812e-02  4.107 4.25e-05 ***
## LocationNagpur      1.676e-01  1.081e-01  1.550 0.121461
## LocationNashik      5.820e-02  7.787e-02  0.747 0.454960
## LocationNavi Mumbai 9.202e-02  6.287e-02  1.464 0.143490
## LocationNoida       9.597e-02  6.413e-02  1.497 0.134746
## LocationPanchkula   -2.740e-02  1.079e-01 -0.254 0.799604
## LocationPatna       6.216e-02  5.200e-02  1.195 0.232170
## LocationPune        1.310e-01  4.601e-02  2.848 0.004468 **
## LocationRaipur      9.927e-02  6.040e-02  1.644 0.100513
## LocationRanchi      -4.610e-02  5.965e-02 -0.773 0.439798
## LocationRanga Reddy 6.674e-02  1.300e-01  0.514 0.607655
## LocationRoorkee     4.763e-02  1.098e-01  0.434 0.664466
## LocationSalem       4.209e-01  1.290e-01  3.264 0.001128 **
## LocationSurat       4.111e-02  8.797e-02  0.467 0.640325
## LocationThane       1.021e-01  6.216e-02  1.642 0.100858
## LocationUdupi       1.480e-01  7.408e-02  1.998 0.045881 *
## LocationVadodara    -9.552e-03  1.081e-01 -0.088 0.929598
## LocationVaranasi    -4.888e-02  6.047e-02 -0.808 0.419060
## LocationWarangal    -6.318e-02  1.290e-01 -0.490 0.624449
## LocationYamunanagar 2.302e-02  1.088e-01  0.212 0.832520
## LocationZirakpur    -2.603e-02  6.193e-02 -0.420 0.674326
## OwnerSecond        -2.011e-02  1.340e-02 -1.501 0.133607
## OwnerThird         -1.212e-01  4.872e-02 -2.488 0.012972 *
## OwnerUnRegistered Car 8.222e-02  9.193e-02  0.894 0.371321
## Max.Torque.RPM      1.067e-02  2.914e-03  3.661 0.000261 ***
## DrivetrainFWD      -2.637e-01  2.231e-02 -11.820 < 2e-16 ***
## DrivetrainRWD      -2.210e-01  2.694e-02 -8.204 5.44e-16 ***
## Length             -7.860e-02  9.661e-03 -8.136 9.26e-16 ***
## Width              1.503e-03  1.077e-04 13.951 < 2e-16 ***
## Year:Kilometer      2.237e-07  5.974e-08  3.745 0.000188 ***
## Year:Max.Torque.RPM -5.232e-06  1.441e-06 -3.631 0.000293 ***
## Year:Length         3.933e-05  4.789e-06  8.212 5.07e-16 ***
## Max.Torque.RPM:Length -3.811e-08  1.344e-08 -2.834 0.004661 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
##
## Residual standard error: 0.1715 on 1335 degrees of freedom
## Multiple R-squared:  0.9439, Adjusted R-squared:  0.9394
## F-statistic: 213.7 on 105 and 1335 DF,  p-value: < 2.2e-16

anova(reduced_model)

## Analysis of Variance Table
##
## Response: log(Price)
##
##           Df Sum Sq Mean Sq  F value    Pr(>F)
## Make       25 354.44   14.178   482.3002 < 2.2e-16 ***
## Year        1 178.52  178.525  6073.1284 < 2.2e-16 ***
## Kilometer   1   0.98   0.982   33.3898 9.375e-09 ***
## Fuel.Type   2  19.23   9.615   327.0934 < 2.2e-16 ***
## Transmission 1  20.31  20.313   691.0000 < 2.2e-16 ***
## Location    63  16.76   0.266    9.0484 < 2.2e-16 ***
## Owner       3   0.46   0.153    5.2159 0.001394 **
## Max.Torque.RPM 1   1.73   1.728   58.7925 3.357e-14 ***
## Drivetrain   2   5.72   2.859   97.2752 < 2.2e-16 ***
## Length      1  52.04  52.042 1770.3899 < 2.2e-16 ***
## Width       1   5.07   5.072  172.5249 < 2.2e-16 ***
## Year:Kilometer 1   1.12   1.119   38.0572 9.091e-10 ***
## Year:Max.Torque.RPM 1   0.95   0.953   32.4200 1.525e-08 ***
## Year:Length   1   2.09   2.092   71.1609 < 2.2e-16 ***
## Max.Torque.RPM:Length 1   0.24   0.236    8.0336 0.004661 **
## Residuals    1335  39.24   0.029
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Normalized Coefficients

```
normalized <- remove_cols(x, old[!(old %in% new)]) # removed from multicollinearity test
normalized <- remove_cols(x, c("Seating.Capacity", "Seller.Type"))

for (col in colnames(normalized)) {
  if (col != "Price" && !(col %in% categorical)) {
    normalized[, col] <- (normalized[, col] - min(normalized[, col])) / (max(normalized[, col]) - min(n
  })
}

normalized_model <- lm(log(Price) ~ . + Year:Kilometer + Year:Max.Torque.RPM
  + Year:Length + Max.Torque.RPM:Length, data = normalized)

sort(abs(normalized_model$coefficients), decreasing = T)

##           (Intercept)           Year:Length           Year
##      12.961291290           1.100828549           0.886192242
##           Length           MakeSsangyong           MakeDatsun
##      0.877863918           0.872512749           0.857115032
##           Width           MakeChevrolet           MakeRenault
##      0.805625162           0.798238688           0.749256440
##           MakeNissan           MakeTata           MakeMINI
##      0.733447399           0.718998608           0.704054157
```

##	MakeMG	MakeMahindra	MakeFord
##	0.596345412	0.596297888	0.572746578
##	MakeMaruti Suzuki	MakeVolkswagen	MakeSkoda
##	0.523222676	0.518324656	0.509078901
##	MakeHonda	MakeHyundai	MakeIsuzu
##	0.485869081	0.465042221	0.437700433
##	LocationSalem	MakeKia	Kilometer
##	0.420870279	0.415501427	0.401541400
##	Max.Torque.RPM:Length	Year:Kilometer	MakeJeep
##	0.397910963	0.392432541	0.333574675
##	Year:Max.Torque.RPM	LocationMysore	LocationBulandshahar
##	0.329846492	0.320886296	0.313704055
##	LocationAurangabad	LocationCoimbatore	DrivetrainFWD
##	0.293113281	0.269393557	0.263692508
##	MakeMitsubishi	MakeToyota	LocationGoa
##	0.249563035	0.248826742	0.248093841
##	LocationBangalore	LocationKollam	DrivetrainRWD
##	0.246496783	0.226788237	0.221018253
##	LocationChennai	LocationIndore	LocationErnakulam
##	0.216077914	0.209724881	0.208988890
##	LocationDharwad	Fuel.TypePetrol	LocationHyderabad
##	0.207341744	0.189472148	0.185525949
##	Max.Torque.RPM	LocationJalandhar	MakeLand Rover
##	0.183830774	0.181224043	0.180846132
##	LocationNagpur	LocationGuwahati	Fuel.TypeDiesel
##	0.167588274	0.167182283	0.164673775
##	LocationUdupi	MakeMercedes-Benz	TransmissionManual
##	0.148042941	0.145432782	0.143902253
##	LocationPune	LocationJaipur	LocationAmritsar
##	0.131030713	0.122967074	0.121805119
##	OwnerThird	LocationKota	LocationMohali
##	0.121210169	0.117146416	0.115934495
##	LocationThane	LocationMumbai	LocationRaipur
##	0.102055354	0.100701797	0.099272043
##	LocationMirzapur	LocationKarnal	LocationNoida
##	0.098291704	0.096670247	0.095972455
##	LocationAmbala Cantt	LocationNavi Mumbai	LocationAllahabad
##	0.092130013	0.092020794	0.090599537
##	LocationKheda	LocationKanpur	OwnerUnRegistered Car
##	0.088221751	0.086058622	0.082215522
##	LocationBhubaneswar	LocationKolkata	LocationDelhi
##	0.080119830	0.076002757	0.071607021
##	LocationFaridabad	LocationMuzaffarpur	LocationRanga Reddy
##	0.069764717	0.068179314	0.066742019
##	MakeJaguar	LocationWarangal	LocationAhmedabad
##	0.065901543	0.063180846	0.062246218
##	LocationPatna	LocationDehradun	LocationNashik
##	0.062160128	0.059305473	0.058196769
##	LocationMangalore	LocationKharar	LocationVaranasi
##	0.056620215	0.056298195	0.048878372
##	LocationRoorkee	LocationRanchi	LocationLudhiana
##	0.047629067	0.046096495	0.043273053
##	LocationSurat	LocationMeerut	LocationChandigarh
##	0.041112278	0.038541407	0.031825300

```
##           MakeVolvo           LocationBhopal           LocationPanchkula
##           0.030938615           0.029053023           0.027400801
##           LocationZirakpur           LocationGhaziabad           LocationYamunanagar
##           0.026027821           0.023076512           0.023015393
##           LocationLucknow           OwnerSecond           LocationJamshedpur
##           0.021634758           0.020113875           0.017254036
##           MakeBMW           LocationHaldwani           LocationGurgaon
##           0.012673995           0.010949026           0.010276737
##           LocationVadodara
##           0.009552204
```

Confidence Intervals

```
confint(reduced_model, level = 0.95)
```

```
##           2.5 %           97.5 %
## (Intercept)           3.097671e+01 2.006291e+02
## MakeBMW           -6.583948e-02 9.118747e-02
## MakeChevrolet           -9.763334e-01 -6.201439e-01
## MakeDatsun           -9.927263e-01 -7.215037e-01
## MakeFord           -6.479947e-01 -4.974984e-01
## MakeHonda           -5.470757e-01 -4.246625e-01
## MakeHyundai           -5.187203e-01 -4.113642e-01
## MakeIsuzu           -6.878548e-01 -1.875461e-01
## MakeJaguar           -8.474833e-02 2.165514e-01
## MakeJeep           -4.327616e-01 -2.343877e-01
## MakeKia           -5.026782e-01 -3.283247e-01
## MakeLand Rover           -2.061831e-02 3.823106e-01
## MakeMahindra           -6.610257e-01 -5.315700e-01
## MakeMaruti Suzuki           -5.784090e-01 -4.680363e-01
## MakeMercedes-Benz           8.097184e-02 2.098937e-01
## MakeMG           -7.040558e-01 -4.886350e-01
## MakeMINI           5.554995e-01 8.526088e-01
## MakeMitsubishi           -4.697699e-01 -2.935620e-02
## MakeNissan           -8.345425e-01 -6.323523e-01
## MakeRenault           -8.246941e-01 -6.738188e-01
## MakeSkoda           -5.822294e-01 -4.359284e-01
## MakeSsangyong           -1.094264e+00 -6.507613e-01
## MakeTata           -7.913884e-01 -6.466088e-01
## MakeToyota           -3.076110e-01 -1.900425e-01
## MakeVolkswagen           -5.919894e-01 -4.446599e-01
## MakeVolvo           -7.915660e-02 1.410338e-01
## Year           -9.500900e-02 -1.088987e-02
## Kilometer           -6.888294e-04 -2.160802e-04
## Fuel.TypeDiesel           -2.384552e-01 -9.089237e-02
## Fuel.TypePetrol           -2.563113e-01 -1.226330e-01
## TransmissionManual           -1.687006e-01 -1.191039e-01
## LocationAhmedabad           -3.282940e-02 1.573218e-01
## LocationAllahabad           -3.025746e-01 1.213755e-01
## LocationAmbala Cantt           -2.289298e-01 4.466978e-02
## LocationAmritsar           -6.927460e-02 3.128848e-01
## LocationAurangabad           8.091882e-02 5.053077e-01
## LocationBangalore           1.565970e-01 3.363965e-01
## LocationBhopal           -1.838064e-01 2.419125e-01
```

## LocationBhubaneswar	-1.407892e-01	3.010288e-01
## LocationBulandshahar	-5.709691e-01	-5.643906e-02
## LocationChandigarh	-8.964572e-02	1.532963e-01
## LocationChennai	1.162988e-01	3.158570e-01
## LocationCoimbatore	1.530404e-01	3.857467e-01
## LocationDehradun	-5.481136e-02	1.734223e-01
## LocationDelhi	-1.463001e-02	1.578440e-01
## LocationDharwad	-4.548198e-02	4.601655e-01
## LocationErnakulam	-4.516543e-02	4.631432e-01
## LocationFaridabad	-1.802835e-01	4.075409e-02
## LocationGhaziabad	-2.777928e-01	2.316398e-01
## LocationGoa	5.605099e-02	4.401367e-01
## LocationGurgaon	-1.205426e-01	9.998910e-02
## LocationGuwahati	-7.706673e-03	3.420712e-01
## LocationHaldwani	-2.644659e-01	2.425678e-01
## LocationHyderabad	9.430717e-02	2.767447e-01
## LocationIndore	2.028461e-02	3.991652e-01
## LocationJaipur	1.562376e-02	2.303104e-01
## LocationJalandhar	6.811753e-02	2.943306e-01
## LocationJamshedpur	-1.932662e-01	1.587581e-01
## LocationKanpur	-1.871899e-01	1.507262e-02
## LocationKarnal	-4.926889e-02	2.426094e-01
## LocationKharar	-1.973544e-01	3.099507e-01
## LocationKheda	-3.411327e-01	1.646892e-01
## LocationKolkata	-1.712186e-01	1.921307e-02
## LocationKollam	-2.665001e-02	4.802265e-01
## LocationKota	-1.592889e-01	3.935818e-01
## LocationLucknow	-7.389690e-02	1.171664e-01
## LocationLudhiana	-5.740803e-02	1.439541e-01
## LocationMangalore	-1.326422e-01	2.458826e-01
## LocationMeerut	-1.079708e-01	1.850536e-01
## LocationMirzapur	-1.768274e-01	3.734108e-01
## LocationMohali	6.890658e-03	2.249783e-01
## LocationMumbai	1.463348e-02	1.867701e-01
## LocationMuzaffarpur	-3.213162e-01	1.849576e-01
## LocationMysore	1.676259e-01	4.741467e-01
## LocationNagpur	-4.456527e-02	3.797418e-01
## LocationNashik	-9.455767e-02	2.109512e-01
## LocationNavi Mumbai	-3.130472e-02	2.153463e-01
## LocationNoida	-2.983226e-02	2.217772e-01
## LocationPanchkula	-2.391027e-01	1.843011e-01
## LocationPatna	-3.985521e-02	1.641755e-01
## LocationPune	4.077207e-02	2.212894e-01
## LocationRaipur	-1.922212e-02	2.177662e-01
## LocationRanchi	-1.631170e-01	7.092398e-02
## LocationRanga Reddy	-1.882123e-01	3.216963e-01
## LocationRoorkee	-1.677348e-01	2.629929e-01
## LocationSalem	1.678870e-01	6.738535e-01
## LocationSurat	-1.314596e-01	2.136842e-01
## LocationThane	-1.988465e-02	2.239954e-01
## LocationUdupi	2.711925e-03	2.933740e-01
## LocationVadodara	-2.216110e-01	2.025066e-01
## LocationVaranasi	-1.675057e-01	6.974894e-02
## LocationWarangal	-3.163003e-01	1.899386e-01

## LocationYamunanagar	-1.904491e-01	2.364799e-01
## LocationZirakpur	-1.475090e-01	9.545337e-02
## OwnerSecond	-4.640287e-02	6.175123e-03
## OwnerThird	-2.167867e-01	-2.563362e-02
## OwnerUnRegistered Car	-9.813258e-02	2.625636e-01
## Max.Torque.RPM	4.950203e-03	1.638198e-02
## DrivetrainFWD	-3.074587e-01	-2.199264e-01
## DrivetrainRWD	-2.738714e-01	-1.681651e-01
## Length	-9.755450e-02	-5.964957e-02
## Width	1.291687e-03	1.714377e-03
## Year:Kilometer	1.065315e-07	3.409337e-07
## Year:Max.Torque.RPM	-8.057828e-06	-2.405186e-06
## Year:Length	2.993538e-05	4.872614e-05
## Max.Torque.RPM:Length	-6.448120e-08	-1.173199e-08