Presentation

Group

4/20/2022

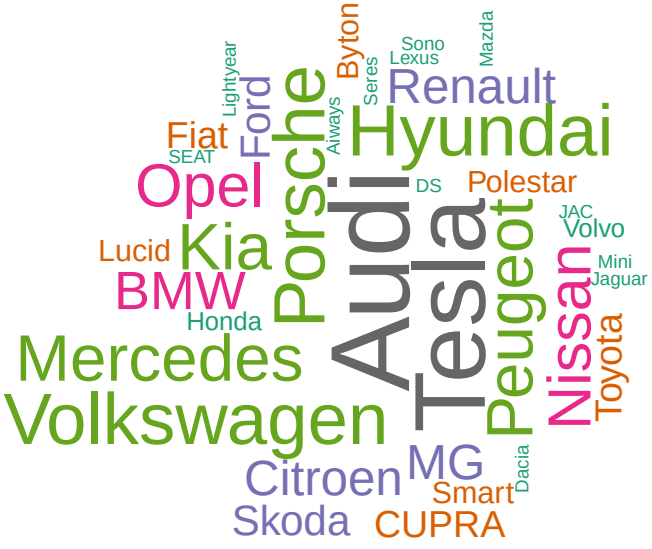
Introduction

- Description
- Research Question:

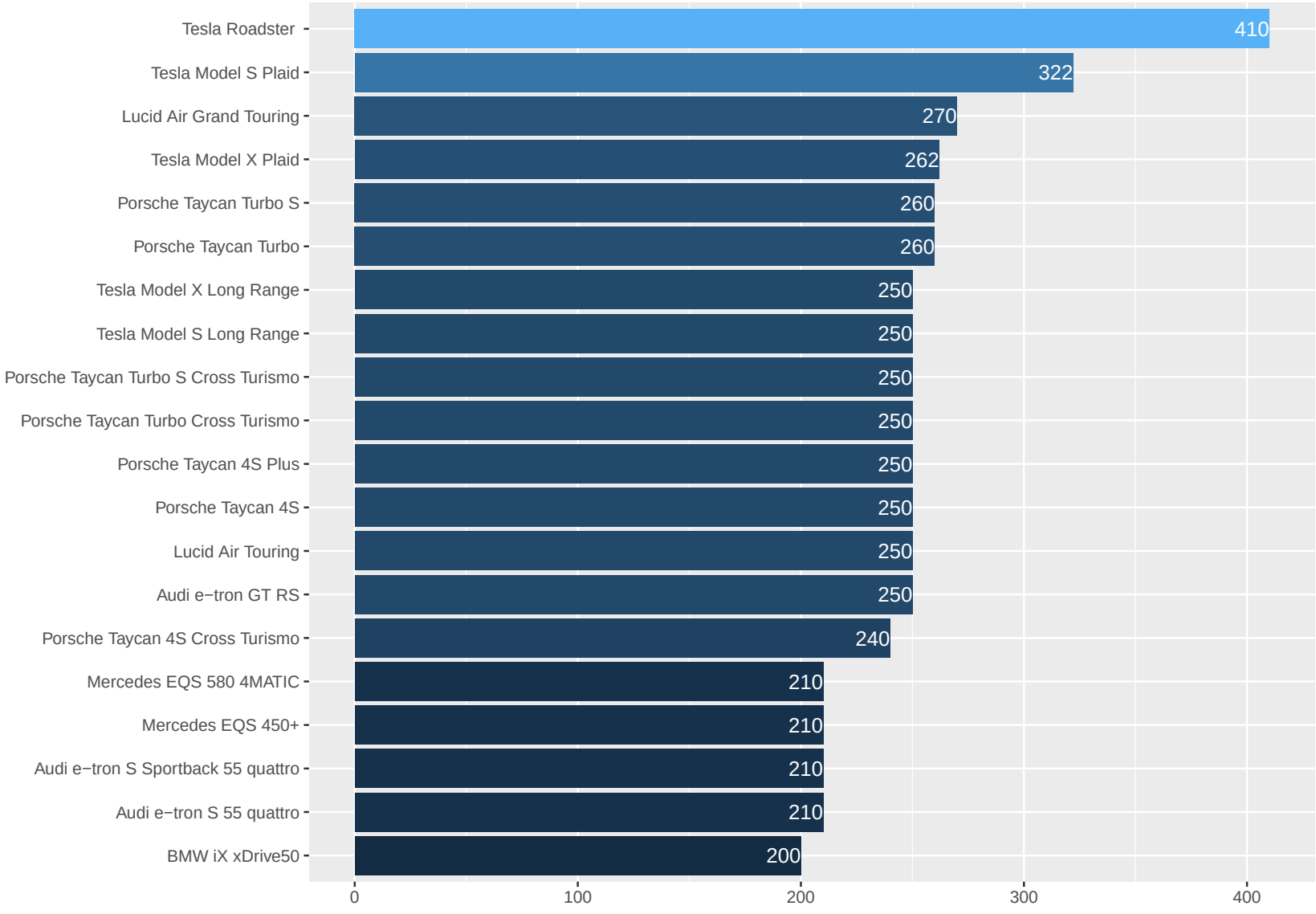
  Which characteristics of Electric Vehicles have a significant impact on their price?

Data Description

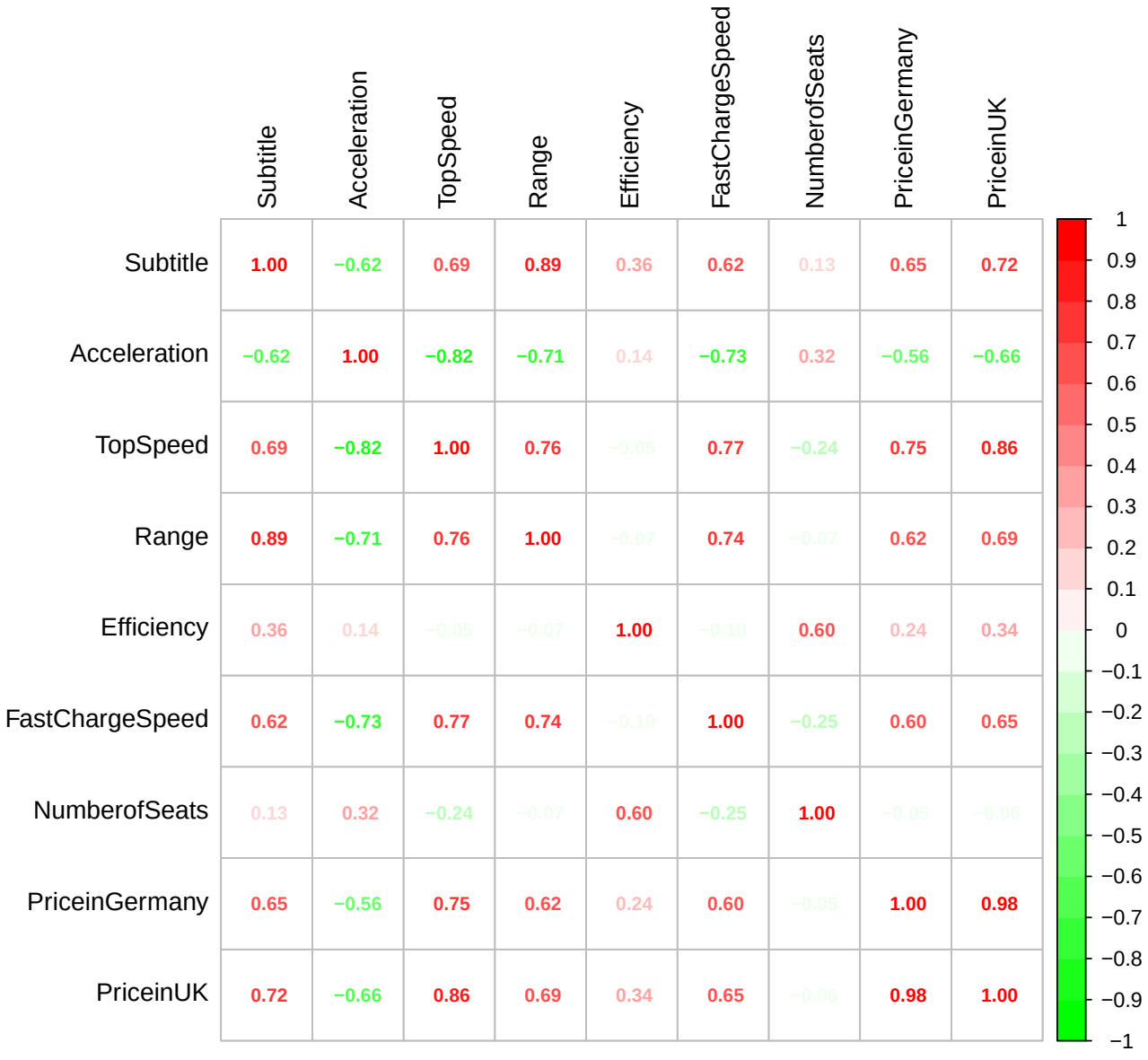
Word Cloud


Audi
Tesla
Hyundai
Mercedes
Volkswagen
Porsche
Peugeot
Renault
Nissan
Kia
Opel
BMW
Fiat
Ford
Citroen
MG
Skoda
CUPRA
Smart
Toyota
Volvo
Polestar
Honda
Lucid
Byton
Lightyear
Sono
Lexus
Mazda
Seres
Aiways
SEAT
DS
JAC
Mini
Jaguar
Dacia

Bar Chart


Tesla Roadster
Tesla Model S Plaid
Lucid Air Grand Touring
Tesla Model X Plaid
Porsche Taycan Turbo S
Porsche Taycan Turbo
Tesla Model X Long Range
Tesla Model S Long Range
Porsche Taycan Turbo S Cross Turismo
Porsche Taycan Turbo Cross Turismo
Porsche Taycan 4S Plus
Porsche Taycan 4S
Lucid Air Touring
Audi e−tron GT RS
Porsche Taycan 4S Cross Turismo
Mercedes EQS 580 4MATIC
Mercedes EQS 450+
Audi e−tron S Sportback 55 quattro
Audi e−tron S 55 quattro
BMW iX xDrive50
410
322
270
262
260
260
250
250
250
250
250
250
250
250
240
210
210
210
210
200
0
100
200
300
400

Correlation Matrix



	Subtitle	Acceleration	TopSpeed	Range	Efficiency	FastChargeSpeed	NumberofSeats	PriceinGermany	PriceinUK
Subtitle	1.00	−0.62	0.69	0.89	0.36	0.62	0.13	0.65	0.72
Acceleration	−0.62	1.00	−0.82	−0.71	0.14	−0.73	0.32	−0.56	−0.66
TopSpeed	0.69	−0.82	1.00	0.76	−0.05	0.77	−0.24	0.75	0.86
Range	0.89	−0.71	0.76	1.00	−0.07	0.74	−0.07	0.62	0.69
Efficiency	0.36	0.14	−0.05	−0.07	1.00	−0.10	0.60	0.24	0.34
FastChargeSpeed	0.62	−0.73	0.77	0.74	−0.10	1.00	−0.25	0.60	0.65
NumberofSeats	0.13	0.32	−0.24	−0.07	0.60	−0.25	1.00	−0.05	−0.06
PriceinGermany	0.65	−0.56	0.75	0.62	0.24	0.60	−0.05	1.00	0.98
PriceinUK	0.72	−0.66	0.86	0.69	0.34	0.65	−0.06	0.98	1.00

Process

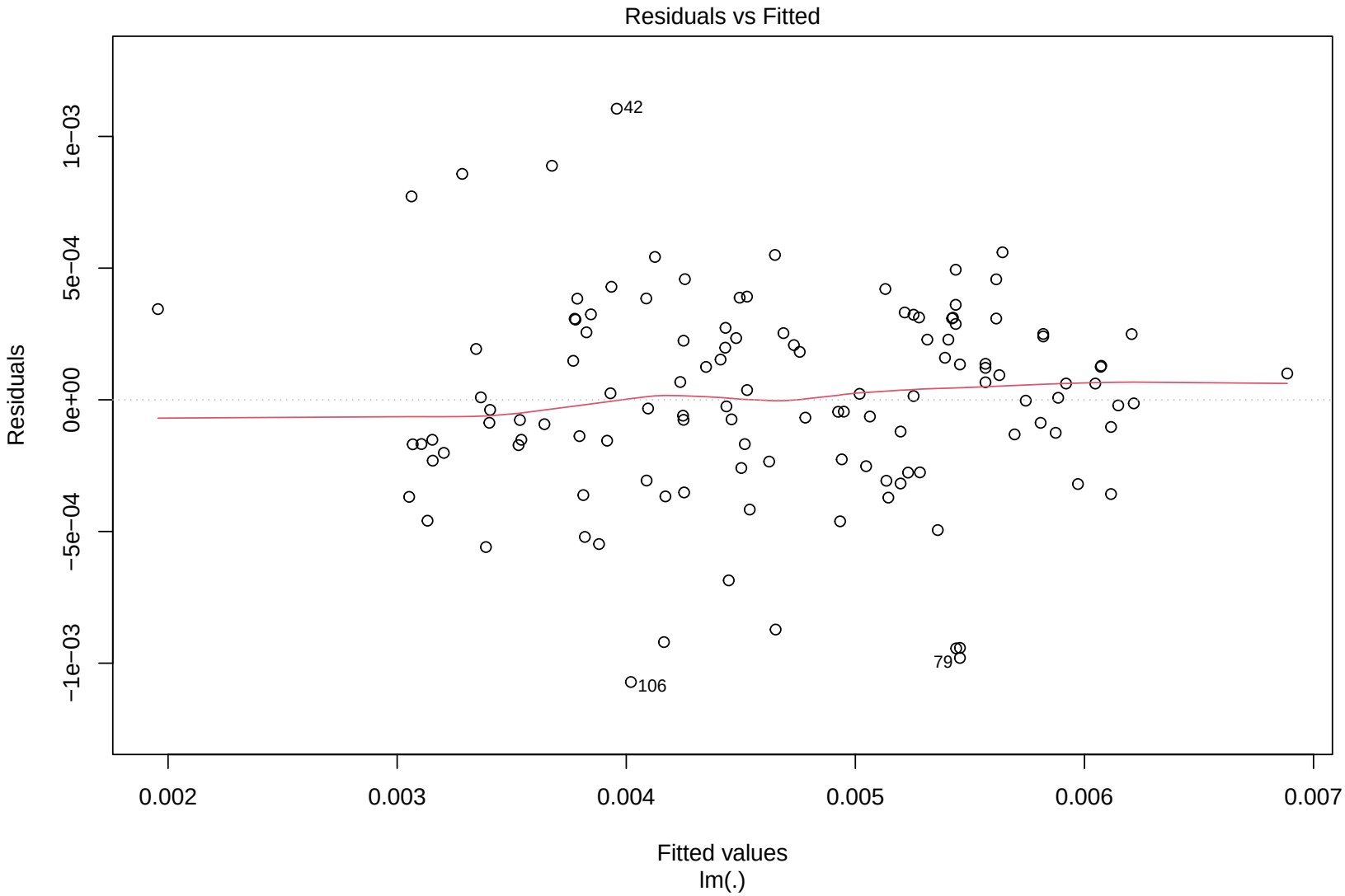
Final Model

$$\begin{aligned}\frac{1}{\sqrt{\texttt{PriceinUK}}} &= \beta_0 \\ &+ \beta_1 \ln \texttt{Range} \\ &+ \beta_2 \texttt{Acceleration} + \beta_3 \texttt{Acceleration}^2 \\ &+ \beta_4 \texttt{TopSpeed} + \beta_5 \texttt{TopSpeed}^2 \\ &+ \beta_6 \texttt{Efficiency} + \beta_7 \texttt{Efficiency}^2 \\ &+ \beta_8 \texttt{NumberofSeats} \\ &+ \epsilon\end{aligned}$$

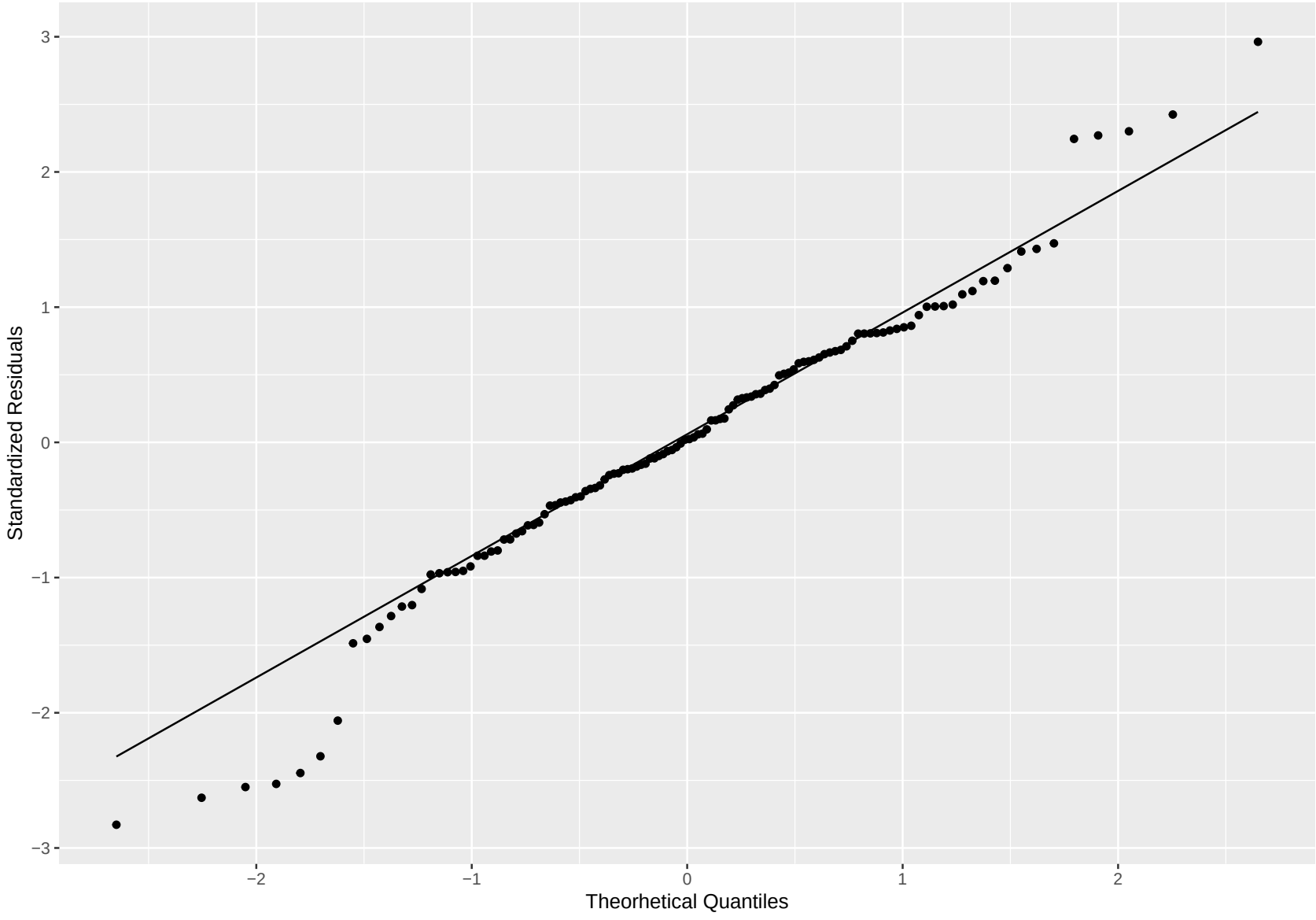
Results

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	0.0191479	0.0015399	12.434199	0.0000000
log(Range)	-0.0005637	0.0001617	-3.487202	0.0006865
poly(TopSpeed, 2, raw = T)1	-0.0000342	0.0000047	-7.333547	0.0000000
poly(TopSpeed, 2, raw = T)2	0.0000000	0.0000000	4.588899	0.0000112
poly(Efficiency, 2, raw = T)1	-0.0000527	0.0000139	-3.789260	0.0002394
poly(Efficiency, 2, raw = T)2	0.0000001	0.0000000	2.889679	0.0045905

Residuals vs Fitted Values Plot



Q-Q Plot


Standardized Residuals
3
2
1
0
−1
−2
−3
−2
−1
0
1
2
Theorhetical Quantiles

Assumptions Tests

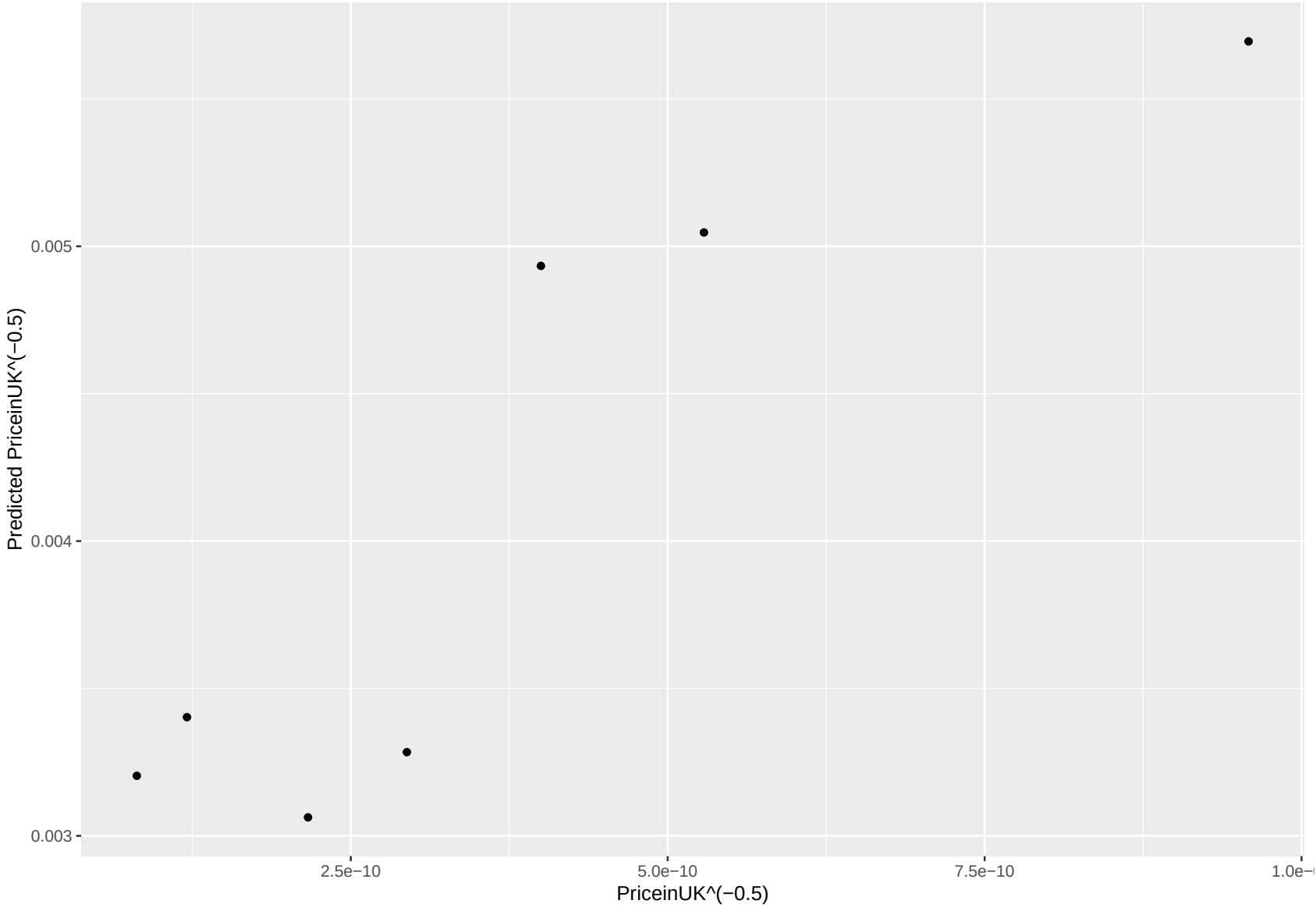
```
##
##  Shapiro-Wilk normality test
##
## data:  .
## W = 0.97388, p-value = 0.01654

##
##  studentized Breusch-Pagan test
##
## data:  .
## BP = 25.56, df = 5, p-value = 0.0001086
```

Outliers

Here, outlier was defined as points that were both high leverage and high residual.

	Name	PriceinUK
14	Tesla Roadster	189000
35	Mercedes EQV 300 Long	70665
43	Tesla Cybertruck Dual Motor	48000
44	Tesla Cybertruck Tri Motor	68000

Testing


0.005
0.004
0.003
Predicted PriceinUK^(−0.5)
2.5e−10
5.0e−10
7.5e−10
PriceinUK^(−0.5)

Prediction Error

prediction	R2	MAE	RMSE
`1 / sqrt(PriceinUK)`	0.7970134	4.089800e-03	4.213100e-03
`PriceinUK`	0.5677872	1.511241e+04	2.063167e+04

Conclusion