

Coursera Regression Models Project

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Sunday, September 21, 2014

Problem Statement

You work for Motor Trend, a magazine about the automobile industry. Looking at a data set of a collection of cars, they are interested in exploring the relationship between a set of variables and miles per gallon (MPG) (outcome). They are particularly interested in the following two questions:

1. Is an automatic or manual transmission better for MPG?
2. Quantify the MPG difference between automatic and manual transmissions?

```
data(mtcars); head(mtcars);
```

```
##           mpg cyl  disp  hp  drat   wt  qsec vs am gear carb
## Mazda RX4      21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag  21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710      22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive  21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
## Valiant        18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

Model 1

Model 1 provides a direct comparison between the transmission type and the mpg. This model would lead us to believe that a manual transmission (am1) would improve MPG by about 7.

```
fit1 <- lm(mpg~am-1, data=mtcars); summary(fit1)$coef
```

```
##      Estimate Std. Error t value Pr(>|t|)
## am0      17.15      1.125   15.25 1.134e-15
## am1      24.39      1.360   17.94 1.376e-17
```

Model 2

Model 2 adds weight to Model 1. Weight is chosen as it often impacts MPG. This model shows that weight reduces MPG. Also note that difference between automatic and manual is small which is an indicator that transmission does not have an impact on MPG

```
fit2 <- lm(mpg~am+wt-1, data=mtcars); summary(fit2)$coef
```

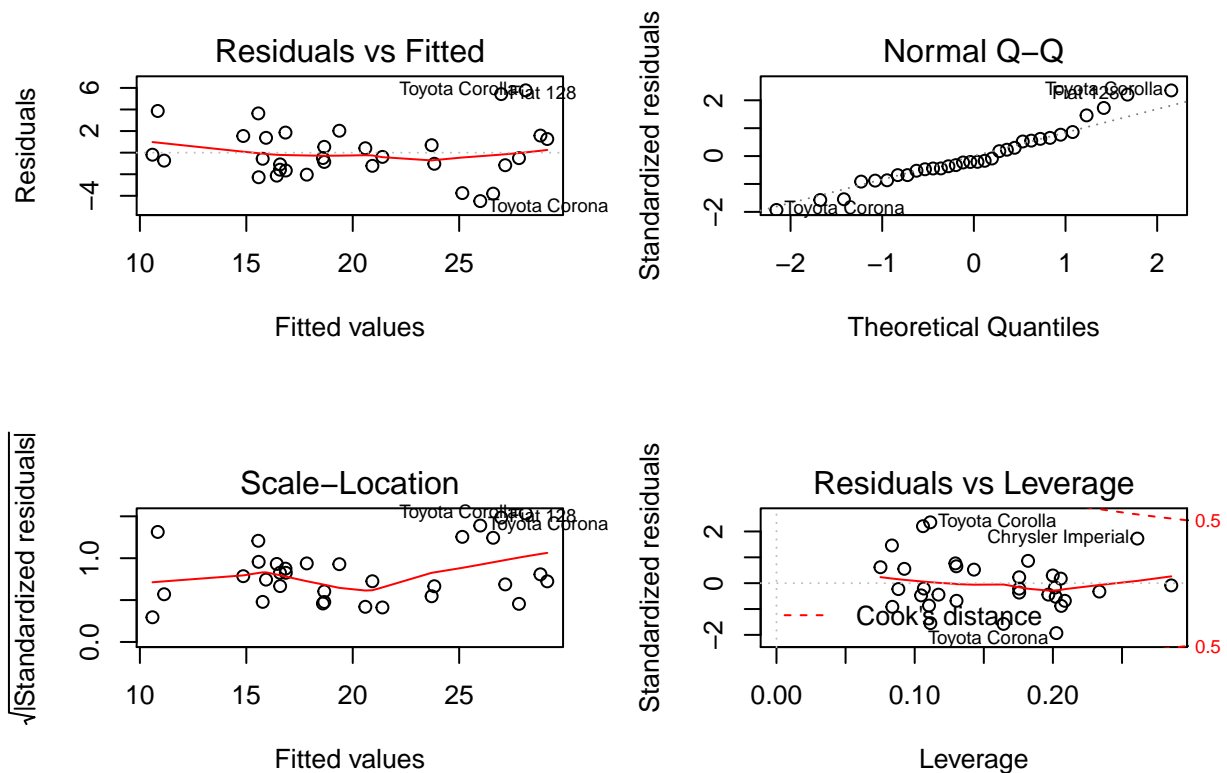
```
##      Estimate Std. Error t value Pr(>|t|)
## am0      37.322      3.0546  12.218 5.843e-13
## am1      37.298      2.0857  17.883 3.326e-17
## wt       -5.353      0.7882  -6.791 1.867e-07
```

Model 3

Model 3 adds cylinders to Model 2. Cylinder count is chosen since it will often impact MPG. Similar to Model 2, the addition of cylinders indicates that a larger number of cylinders further reduces MPG. Also, the difference for the transmission types is small, further indicating that transmission does not impact MPG.

```
fit3 <- lm(mpg~am+wt+cyl-1, data=mtcars); summary(fit3)$coef
```

##		Estimate	Std. Error	t value	Pr(> t)
##	am0	33.754	2.813	11.997	2.496e-12
##	am1	33.904	2.065	16.420	1.413e-15
##	wt	-3.150	0.908	-3.469	1.771e-03
##	cyl6	-4.257	1.411	-3.017	5.515e-03
##	cyl8	-6.079	1.684	-3.611	1.228e-03



Conclusions

1. Is an automatic or manual transmission better for MPG?

Neither is a factor when other attributes are considered.

2. Quantify the MPG difference between automatic and manual transmissions?