Motor Trend Magazine mpg Transmission Analysis

Ann Crawford

October 2, 2017

## Executive Summary

Apply regression models and exploratory data analyses on mtcars to answer the following examine the affect of transmision on mileage.  
1. Is an automatic or manual transmission betterfor MPG? In this case better means higher value for miles per gallon. 2. Quantify the MPG difference between automatic and manual transmissions. While many factors may influce miles per gallon, this analysis isolates the mpg differences attributed to transmission.

From the help A data frame with 32 observations on 11 variables.

[, 1] mpg Miles/(US) gallon [, 2] cyl Number of cylinders [, 3] disp Displacement (cu.in.) [, 4] hp Gross horsepower [, 5] drat Rear axle ratio [, 6] wt Weight (1000 lbs) [, 7] qsec 1/4 mile time [, 8] vs V/S [, 9] am Transmission (0 = automatic, 1 = manual) [,10] gear Number of forward gears [,11] carb Number of carburetors

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

First start with simple linear regression using transmisison and the single perdictor for mpg. The plot shows that mannual transmissions have higher mpg in general.

summary(mtcars)

## mpg cyl disp hp   
## Min. :10.40 Min. :4.000 Min. : 71.1 Min. : 52.0   
## 1st Qu.:15.43 1st Qu.:4.000 1st Qu.:120.8 1st Qu.: 96.5   
## Median :19.20 Median :6.000 Median :196.3 Median :123.0   
## Mean :20.09 Mean :6.188 Mean :230.7 Mean :146.7   
## 3rd Qu.:22.80 3rd Qu.:8.000 3rd Qu.:326.0 3rd Qu.:180.0   
## Max. :33.90 Max. :8.000 Max. :472.0 Max. :335.0   
## drat wt qsec vs   
## Min. :2.760 Min. :1.513 Min. :14.50 Min. :0.0000   
## 1st Qu.:3.080 1st Qu.:2.581 1st Qu.:16.89 1st Qu.:0.0000   
## Median :3.695 Median :3.325 Median :17.71 Median :0.0000   
## Mean :3.597 Mean :3.217 Mean :17.85 Mean :0.4375   
## 3rd Qu.:3.920 3rd Qu.:3.610 3rd Qu.:18.90 3rd Qu.:1.0000   
## Max. :4.930 Max. :5.424 Max. :22.90 Max. :1.0000   
## am gear carb   
## Min. :0.0000 Min. :3.000 Min. :1.000   
## 1st Qu.:0.0000 1st Qu.:3.000 1st Qu.:2.000   
## Median :0.0000 Median :4.000 Median :2.000   
## Mean :0.4062 Mean :3.688 Mean :2.812   
## 3rd Qu.:1.0000 3rd Qu.:4.000 3rd Qu.:4.000   
## Max. :1.0000 Max. :5.000 Max. :8.000

str(mtcars)

## 'data.frame': 32 obs. of 11 variables:  
## $ mpg : num 21 21 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 ...  
## $ cyl : num 6 6 4 6 8 6 8 4 4 6 ...  
## $ disp: num 160 160 108 258 360 ...  
## $ hp : num 110 110 93 110 175 105 245 62 95 123 ...  
## $ drat: num 3.9 3.9 3.85 3.08 3.15 2.76 3.21 3.69 3.92 3.92 ...  
## $ wt : num 2.62 2.88 2.32 3.21 3.44 ...  
## $ qsec: num 16.5 17 18.6 19.4 17 ...  
## $ vs : num 0 0 1 1 0 1 0 1 1 1 ...  
## $ am : num 1 1 1 0 0 0 0 0 0 0 ...  
## $ gear: num 4 4 4 3 3 3 3 4 4 4 ...  
## $ carb: num 4 4 1 1 2 1 4 2 2 4 ...

### Step 1 examine the data.  
y <- mtcars$mpg  
x <- mtcars$am  
# check for nas   
sapply(mtcars,function(x) sum(is.na(x)))

## mpg cyl disp hp drat wt qsec vs am gear carb   
## 0 0 0 0 0 0 0 0 0 0 0

sapply(mtcars, function(x) length(unique(x)))

## mpg cyl disp hp drat wt qsec vs am gear carb   
## 25 3 27 22 22 29 30 2 2 3 6

library(dplyr)

##   
## Attaching package: 'dplyr'

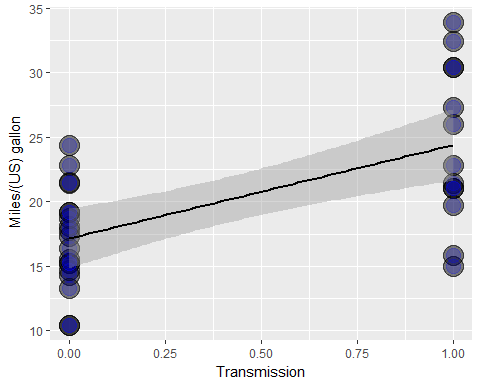
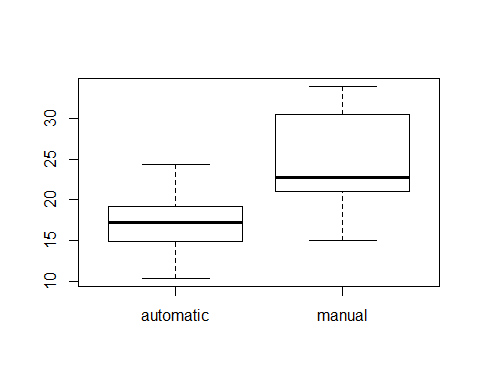
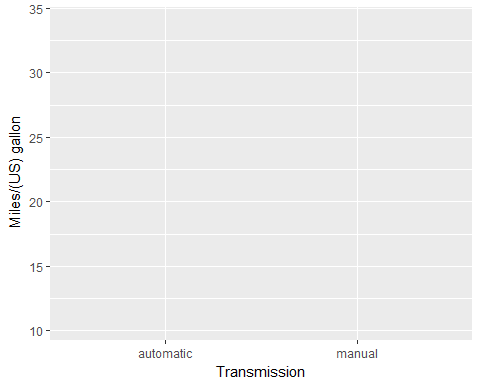
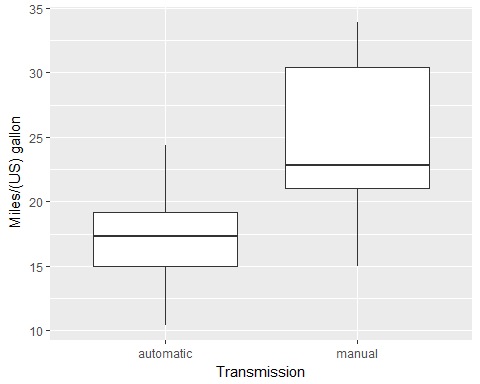
## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

mtcars1 <- mutate(mtcars, trans = as.factor(ifelse(am == 0, "automatic","manual")))

## Including Plots

You can also embed plots, for example:



#Residuals represent variation left unexplained by our model.

fit2 <- lm(mpg ~ ., data = mtcars) Note that the echo = FALSE parameter was added to the code chunk to prevent printing of the R code that generated the plot.

```