Automatic or Manual transmission better for MPG

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1 Executive Summary

There is a set of variables related to miles per gallon (MPG) (outcome).

Here the difference of the MPG between automatic and manual transmissions is focused, the `mtcars` dataset in car package is taken as the data source, and techniques about regression models is used to solve the following two questions:

- "Is an automatic or manual transmission better for MPG"
- "Quantifying how different is the MPG between automatic and manual transmissions?"

2 Data Processing

2.1 Load and Test Data

> The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973–74 models).

```r
library(datasets)
mpgData <- with(mtcars, data.frame(mpg, am))
mpgData$am <- factor(mpgData$am, labels = c("Automatic", "Manual"))
#summary(mpgData)
```

2.2   Process Data

2.2.1   Q1: Is an automatic or manual transmission better for MPG?

```
summary(mpgData[mpgData$am == "Automatic",])
```

```
##       mpg                 am
## Min.   :10.40   Automatic:19
## 1st Qu.:14.95   Manual   : 0
## Median :17.30
## Mean   :17.15
## 3rd Qu.:19.20
## Max.   :24.40
```

```
summary(mpgData[mpgData$am == "Manual",])
```

```
##       mpg                 am
## Min.   :15.00   Automatic: 0
## 1st Qu.:21.00   Manual   :13
## Median :22.80
## Mean   :24.39
## 3rd Qu.:30.40
## Max.   :33.90
```

2.2.2   Q2: Quantifying how different is the MPG between automatic and manual transmissions?

```
fit <- lm(mpg ~ as.integer(am), data=mpgData)
summary(fit)
```

```
##
## Call:
## lm(formula = mpg ~ as.integer(am), data = mpgData)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.3923 -3.0923 -0.2974  3.2439  9.5077
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)        9.902      2.628   3.768 0.000720 ***
## as.integer(am)     7.245      1.764   4.106 0.000285 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.902 on 30 degrees of freedom
## Multiple R-squared:  0.3598, Adjusted R-squared:  0.3385
## F-statistic: 16.86 on 1 and 30 DF,  p-value: 0.000285
```
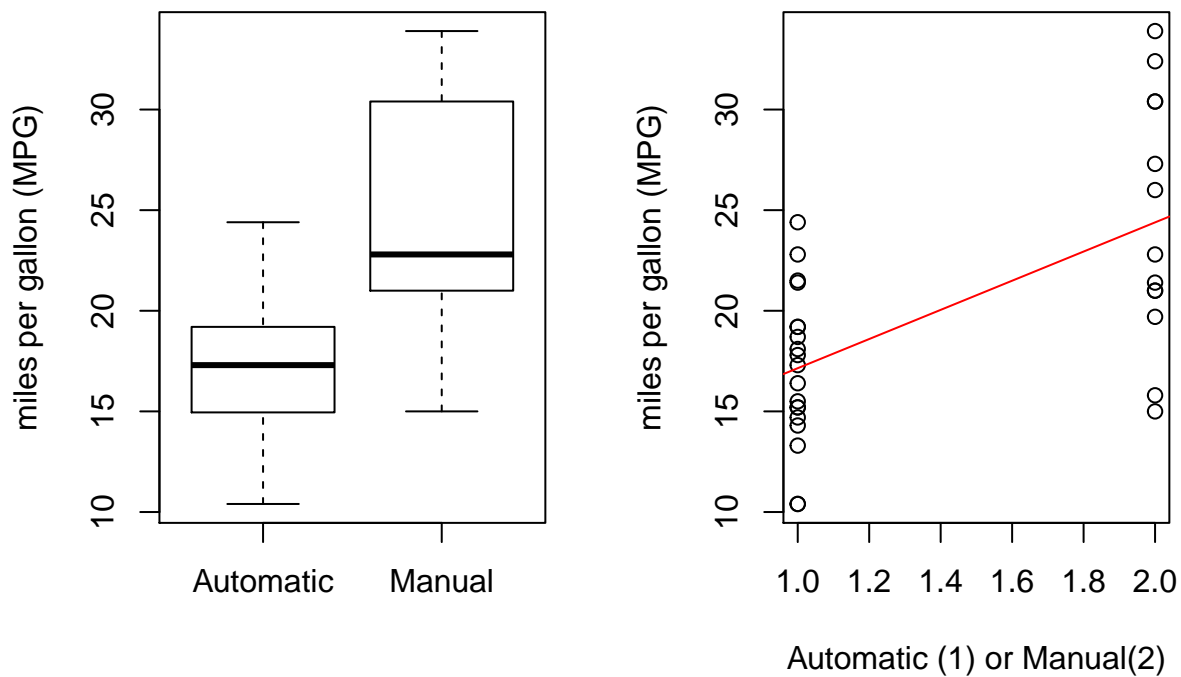
3 Results

So, manual transmission is better than automatic for MPG, which increased by 7.2449393.

4 Appendix

4.1 Fig 1. MPG between automatic and manual transmissions

```
par(mfrow=c(1,2))
with(mpgData,{
    boxplot(mpg ~ am,
            ylab = "miles per gallon (MPG)")
    plot(mpg ~ as.integer(am),
            xlab = "Automatic (1) or Manual(2)",
            ylab = "miles per gallon (MPG)")
    abline(fit, col=2)
    })
```


4.2 SourceCode

Project_Report.Rmd

4.3 Relationship between other variables and miles per gallon (MPG)

Shiny App