

# Regression Analysis on Fuel Efficiency

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## Executive Summary

This project will explore the relationship between miles per gallon (MPG) and other variables from the Motor Trends dataset. We are particularly interested in the following two questions:

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

Our first guess is manual transmission is better for MPG than automatic transmission. The exploratory t.test verifies this guess.

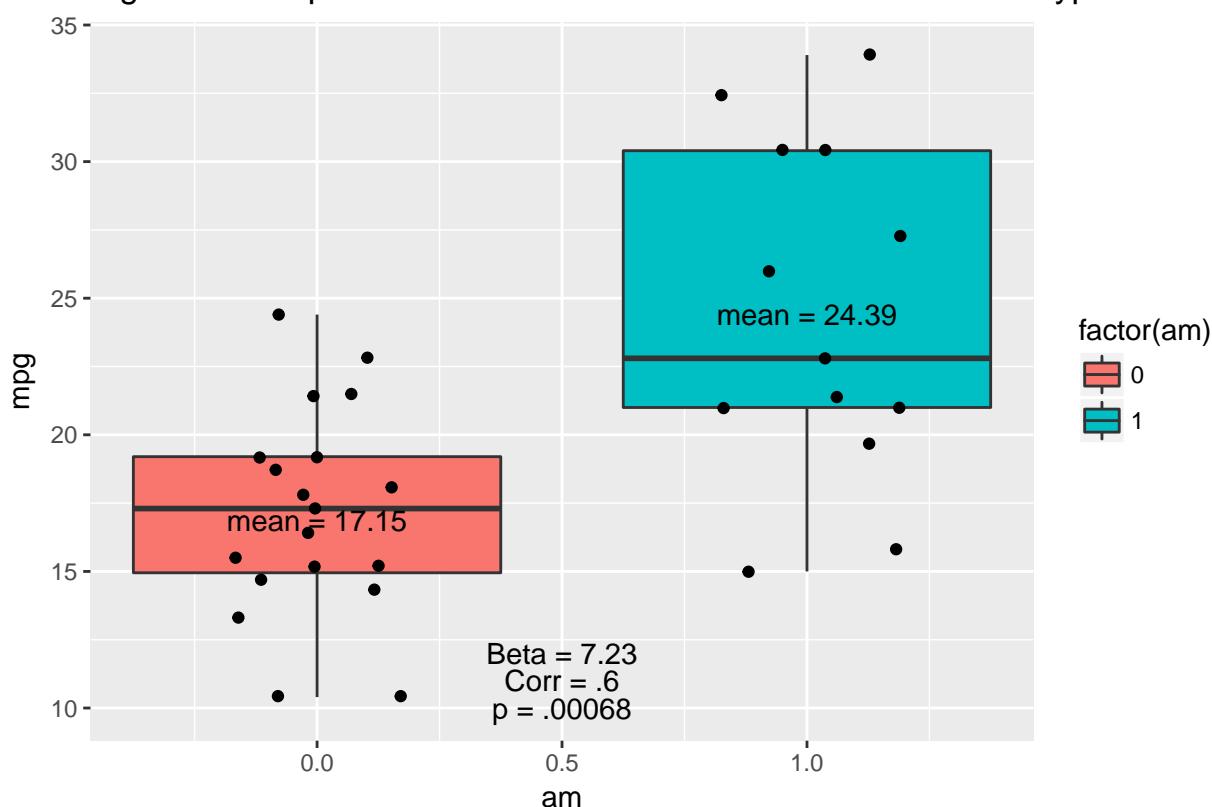
## Exploratory Hypothesis Testing

The following t.test and boxplots (Figure 1) show that the average MPG of manual transmission is significantly higher than that of automatic transmission. Therefore, based on the significant level of 5%, we can conclude that **manual transmission is better for MPG than automatic transmission**. Please refer to Appendix I about loading and splitting data.

```
t.test(manual$mpg, auto$mpg, alternative = "less")$p.value
```

```
## [1] 0.0006868192
```

Figure 1: Sample Distribution of MPG based on Transmission Types



## Conclusion

Our analysis shows that **manual transmission is more fuel efficient than automatic transmission.**

## Appendix I: Loading and Splitting Data

- Loading Data

```
require(datasets)
require(plyr)
require(ggplot2)
require(GGally)
require(car)
data("mtcars")
attach(mtcars)
```

- Splitting Data

```
auto <- mtcars[which(am == 1), ]
manual <- mtcars[which(am == 0), ]
```

## Appendix II: Figure 1 Plotting Code

```
figure_1 <- ggplot(mtcars, aes(y=mpg,x=am)) + geom_boxplot(aes(fill=factor(am))) + labs(title = "Figure 1")
figure_1
```