

# Regression Model - Course Project

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## Motor Trend: Analysis on Variables and the Impact on Miles per Gallon

### 1) Executive Summary

The purpose of this analysis is to examine a collection of cars and determine the relationship between vehicle variables (e.g. number of cylinders) and fuel economy (i.e. miles per gallon).

This analysis will seek to answer the following questions:

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

### 2) Data Processing

#### 2.1) Loading Libraries

Load necessary libraries for data analysis and developing results.

```
library(ggplot2)
library(dplyr)
# GGally for the ggpairs function
library(GGally)
# ggfortify
library(ggfortify)
```

#### 2.2) Loading Data

Load necessary mtcars dataset.

```
data(mtcars)
```

#### 2.3) Modifying Data

The variables “cyl” (# cylinders), “vs” (engine shape), “am” (transmission), “gear” (# of gears) will be converted to factor variables since they are not continuous.

```
data(mtcars)

mtcars_data <- mtcars # creating a new mtcars dataframe to be modified
mtcars_data$cyl <- as.factor(mtcars_data$cyl)

mtcars_data$vs <- as.factor(mtcars_data$vs)
```

```

# Set levels for the engine shape (V-shaped or Straight)
levels(mtcars_data$vs) <- c("V-shaped", "Straight")

mtcars_data$am <- as.factor(mtcars_data$am)
# Convert 0 = Automatic and 1 = Manual
levels(mtcars_data$am) <- c("Automatic", "Manual")

mtcars_data$gear <- as.factor(mtcars_data$gear)

```

### 3) Exploratory Data Analyses

```
head(mtcars_data,4) # Sample of the first 4 rows of data
```

```

##           mpg cyl disp  hp drat   wt  qsec    vs          am gear
## Mazda RX4      21.0   6  160 110 3.90 2.620 16.46 V-shaped    Manual    4
## Mazda RX4 Wag  21.0   6  160 110 3.90 2.875 17.02 V-shaped    Manual    4
## Datsun 710      22.8   4  108  93 3.85 2.320 18.61 Straight   Manual    4
## Hornet 4 Drive  21.4   6  258 110 3.08 3.215 19.44 Straight Automatic  3
##           carb
## Mazda RX4      4
## Mazda RX4 Wag  4
## Datsun 710      1
## Hornet 4 Drive  1

```

```
dim(mtcars_data) # Dimensions of the mtcars_data
```

```
## [1] 32 11
```

In order to understand the relationship between transmission type and fuel economy we will develop a box plot to show the impact automatic/manual has on MPG.

Please refer to **Fig. 1** in the Appendix.

After review of **Fig. 1**, it can be seen that manual transmissions results in higher MPG. However, it is not clear if other variables are also influencing this outcome, and if manual transmission vehicles have higher MPG with all else equal. To do so a pair graph will be developed.

### TK) Appendix

**Fig. 1**

```

Fig_1 <- ggplot(mtcars_data, aes(am, mpg))
Fig_1 + geom_boxplot(aes(fill = am)) + xlab("Transmission")

```

