

# Fuel consumption difference between Automatic and Manual transmission

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## Dataset

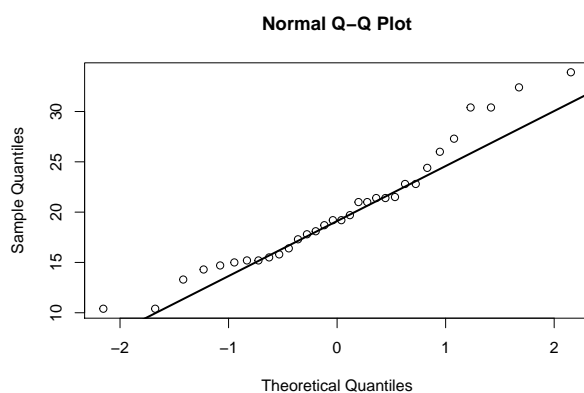
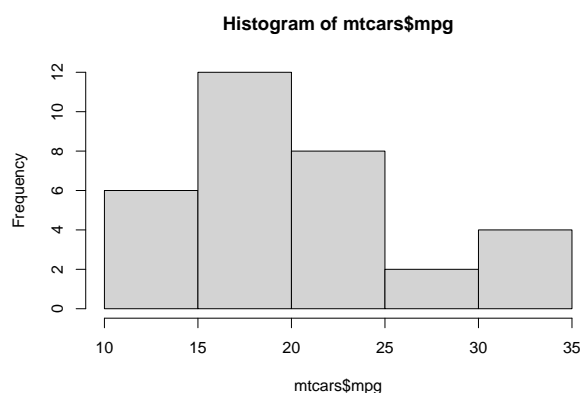
Given the built-in *mtcars* dataset analyze fuel consumption between automatic and manual transmission cars.

```
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
```

Check whether *mpg* comes from a Gaussian distribution with Q-Q plot.

```
hist(mtcars$mpg)
qqnorm(mtcars$mpg, pch = 1)
qqline(mtcars$mpg, lwd = 2)
```



Binary feature *am* represents *automatic* with 0 and *manual* with 1. For convenience we convert it into a categorical variable.

```
mtcars$am <- as.factor(mtcars$am)
levels(mtcars$am) <- c('at', 'mt')
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	mt	4	4
## Mazda RX4 Wag	21.0	6	160	110	3.90	2.875	17.02	0	mt	4	4
## Datsun 710	22.8	4	108	93	3.85	2.320	18.61	1	mt	4	1
## Hornet 4 Drive	21.4	6	258	110	3.08	3.215	19.44	1	at	3	1
## Hornet Sportabout	18.7	8	360	175	3.15	3.440	17.02	0	at	3	2
## Valiant	18.1	6	225	105	2.76	3.460	20.22	1	at	3	1

We split the dataset into two subsets *Automatic(AT)* and *Manual (MT)* transmission. We want to find confidence intervals for 0.95 confidence for the mean *MPG* for both categories. In order to do this we run *t-test*

```
mpg.automatic <- mtcars[mtcars$am == "at",]$mpg
mpg.manual <- mtcars[mtcars$am == "mt",]$mpg
t.test(mpg.automatic, mpg.manual)
```

```
##
## Welch Two Sample t-test
##
## data: mpg.automatic and mpg.manual
## t = -3.7671, df = 18.332, p-value = 0.001374
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -11.280194 -3.209684
## sample estimates:
## mean of x mean of y
## 17.14737 24.39231
```

P-value is *0.001374* which is below the 5% confidence, so alternative hypothesis is accepted. The 95% confidence interval of the difference in mean fuel consumption between *Automatic* and *Manual* transmission is between *3.2* and *11.2*

## References