**Multiple Regression**

Multiple regression is an extension of linear regression into relationship between more than two variables. In simple linear relation we have one predictor and one response variable, but in multiple regression we have more than one predictor variable and one response variable.

The general mathematical equation for multiple regression is −

y = a + b1x1 + b2x2 +...bnxn

Following is the description of the parameters used −

* **y** is the response variable.
* **a, b1, b2...bn** are the coefficients.
* **x1, x2, ...xn** are the predictor variables.

We create the regression model using the **lm()** function in R. The model determines the value of the coefficients using the input data. Next we can predict the value of the response variable for a given set of predictor variables using these coefficients.

lm() Function

This function creates the relationship model between the predictor and the response variable.

Syntax

The basic syntax for **lm()** function in multiple regression is −

lm(y ~ x1+x2+x3...,data)

Following is the description of the parameters used −

* **formula** is a symbol presenting the relation between the response variable and predictor variables.
* **data** is the vector on which the formula will be applied.

Example

Input Data

Consider the data set "mtcars" available in the R environment. It gives a comparison between different car models in terms of mileage per gallon (mpg), cylinder displacement("disp"), horse power("hp"), weight of the car("wt") and some more parameters.

The goal of the model is to establish the relationship between "mpg" as a response variable with "disp","hp" and "wt" as predictor variables. We create a subset of these variables from the mtcars data set for this purpose.

[Live Demo](http://tpcg.io/ITQq8l)

input <- mtcars[,c("mpg","disp","hp","wt")]

print(head(input))

When we execute the above code, it produces the following result −

mpg disp hp wt

Mazda RX4 21.0 160 110 2.620

Mazda RX4 Wag 21.0 160 110 2.875

Datsun 710 22.8 108 93 2.320

Hornet 4 Drive 21.4 258 110 3.215

Hornet Sportabout 18.7 360 175 3.440

Valiant 18.1 225 105 3.460

Create Relationship Model & get the Coefficients

[Live Demo](http://tpcg.io/jBpA0K)

input <- mtcars[,c("mpg","disp","hp","wt")]

# Create the relationship model.

model <- lm(mpg~disp+hp+wt, data = input)

# Show the model.

print(model)

# Get the Intercept and coefficients as vector elements.

cat("# # # # The Coefficient Values # # # ","\n")

a <- coef(model)[1]

print(a)

Xdisp <- coef(model)[2]

Xhp <- coef(model)[3]

Xwt <- coef(model)[4]

print(Xdisp)

print(Xhp)

print(Xwt)