

How to perform Logarithmic Regression in R (Step-by-Step)

Authored by
stats writer

December 9, 2025

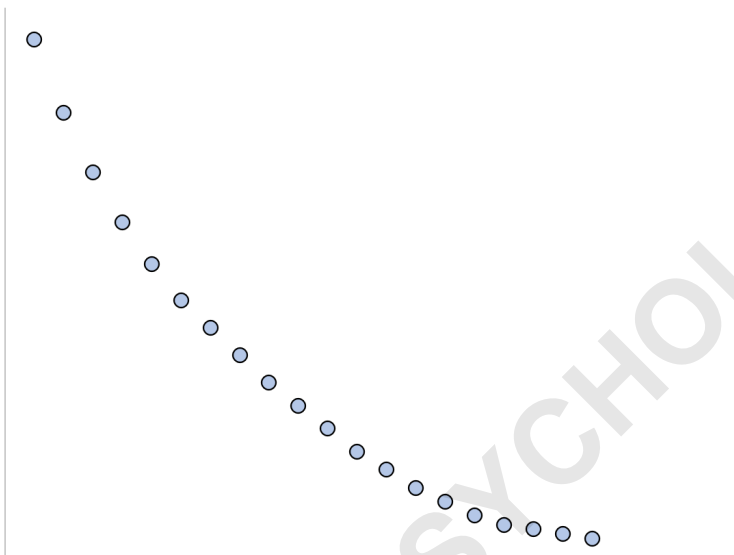
RECOMMENDED CITATION

stats writer (2025). *How to perform Logarithmic Regression in R (Step-by-Step)*.
PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=106811>

Logarithmic regression in R can be performed by first importing the data into R, then adding a column to the data set for the logarithm of the response variable, transforming the independent variables into logarithms, and finally fitting the regression model. The model can then be used to predict the response variable using the logarithms of the independent variables. Finally, the predictions can be plotted to visualize the fitted model.

Logarithmic regression is a type of regression used to model situations where growth or decay accelerates rapidly at first and then slows over time.

For example, the following plot demonstrates an example of logarithmic decay:



For this type of situation, the relationship between a predictor variable and a response variable could be modeled well using logarithmic regression.

The equation of a logarithmic regression model takes the following form:

$$y = a + b \cdot \ln(x)$$

where:

y: The response variable

x: The predictor variable

a, b: The regression coefficients that describe the relationship between x and y

The following step-by-step example shows how to perform logarithmic regression in R.

Step 1: Create the Data

First, let's create some fake data for two variables: x and y :

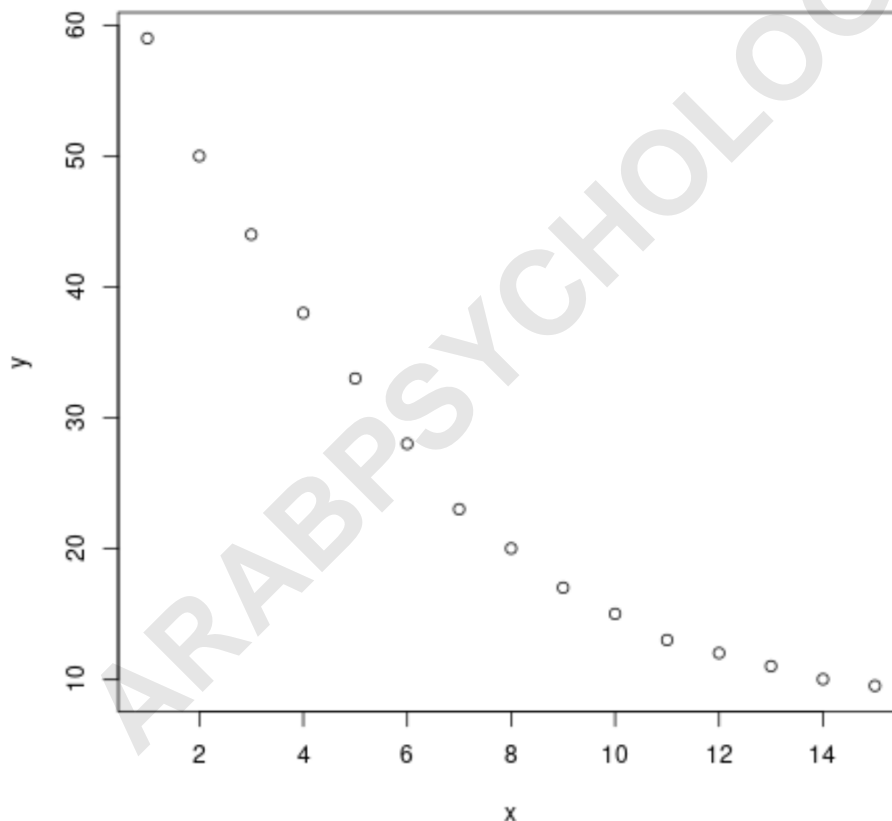
```
x=1:15
```

```
y=c(59, 50, 44, 38, 33, 28, 23, 20, 17, 15, 13, 12, 11, 10, 9.5)
```

Step 2: Visualize the Data

Next, let's create a quick to visualize the relationship between x and y :

```
plot(x, y)
```



From the plot we can see that there exists a clear logarithmic decay pattern between the two variables. The value of the response variable, y , decreases rapidly at first and then slows over time.

Step 3: Fit the Logarithmic Regression Model

Next, we'll use the **lm()** function to fit a logarithmic regression model, using the natural log of x as the predictor variable and y as the response variable

#fit the model

```
model <- lm(y ~ log(x))
```

#view the output of the model

```
summary(model)
```

Call:

```
lm(formula = y ~ log(x))
```

Residuals:

```
Min 1Q Median 3Q Max
```

```
-4.069 -1.313 -0.260 1.127 3.122
```

Coefficients:

```
Estimate Std. Error t value Pr(>|t|)
```

```
(Intercept) 63.0686 1.4090 44.76 1.25e-15 ***
```

```
log(x) -20.1987 0.7019 -28.78 3.70e-13 ***
```

```
---
```

```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Residual standard error: 2.054 on 13 degrees of freedom

Multiple R-squared: 0.9845, Adjusted R-squared: 0.9834

F-statistic: 828.2 on 1 and 13 DF, p-value: 3.702e-13

The F -statistic of the model is 828.2 and the corresponding p -value is extremely small ($3.702e-13$), which indicates that the model as a whole is useful.

Using the coefficients from the output table, we can see that the fitted logarithmic regression equation is:

$$y = 63.0686 - 20.1987 * \ln(x)$$

We can use this equation to predict the response variable, y , based on the value of the predictor variable, x . For example, if $x = 12$, then we would predict that y would be **12.87**:

$$y = 63.0686 - 20.1987 * \ln(12) = \mathbf{12.87}$$

Bonus: Feel free to use this online to automatically compute the logarithmic regression equation for a given predictor and response variable.

Step 4: Visualize the Logarithmic Regression Model

Lastly, we can create a quick plot to visualize how well the logarithmic regression model fits the data:

#plot x vs. y

plot(x, y)

#define x-values to use for regression line

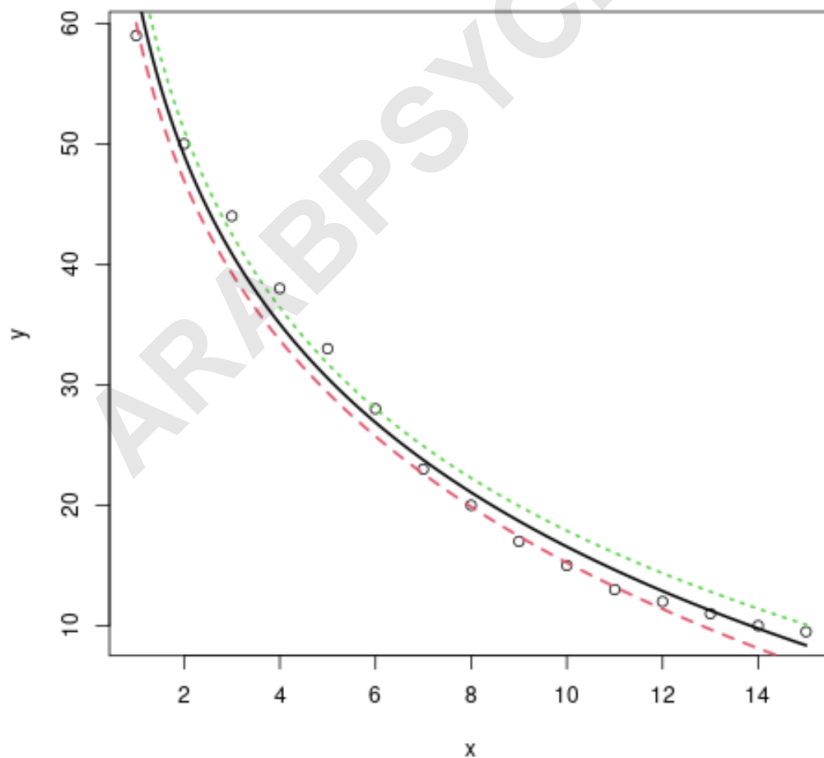
```
x=seq(from=1,to=15,length.out=1000)
```

#use the model to predict the y-values based on the x-values

```
y=predict(model,newdata=list(x=seq(from=1,to=15,length.out=1000)),  
interval="confidence")
```

#add the fitted regression line to the plot (lwd specifies the width of the line)

```
matlines(x,y, lwd=2)
```



We can see that the logarithmic regression model does a good job of fitting this particular dataset.