

How can I perform exponential regression in R using a step-by-step approach?

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RECOMMENDED CITATION

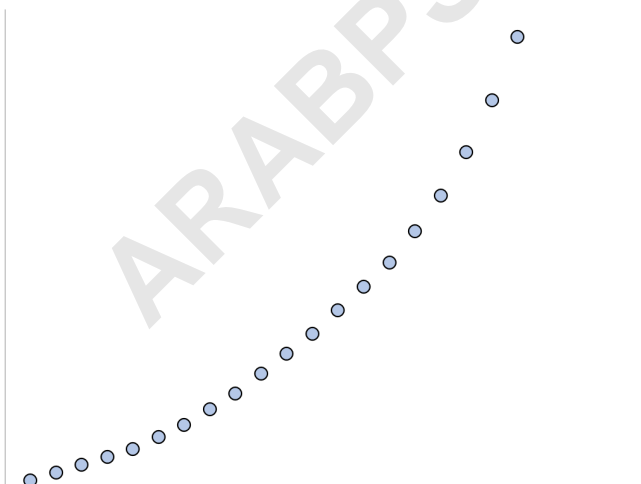
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Exponential regression is a statistical method used to model relationships between variables that follow an exponential pattern. In R, this can be performed using a step-by-step approach. Firstly, the data should be imported into R and a scatter plot should be created to visualize the relationship between the variables. Next, the "lm()" function should be used to fit a linear model to the data. Then, the "log()" function should be applied to transform the response variable into a logarithmic scale. This transformed model can be plotted and assessed to check for linearity. Finally, the "exp()" function can be used to transform the predicted values back to their original scale, to obtain the final exponential regression model. Additional steps may include evaluating the model's fit and making predictions. By following this step-by-step approach, exponential regression can be easily performed in R.

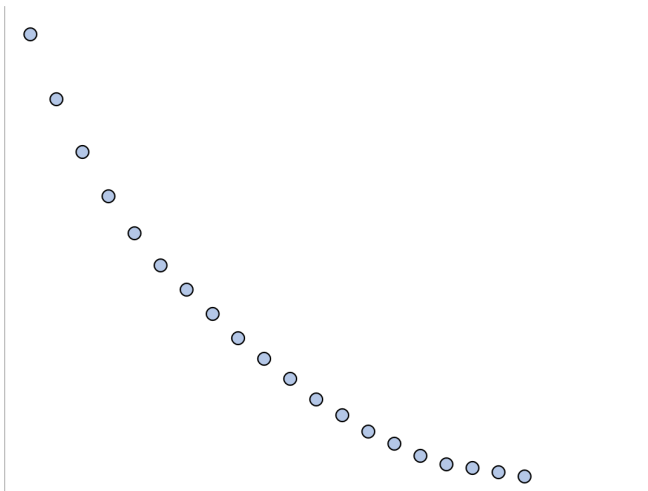
Exponential Regression in R (Step-by-Step)

Exponential regression is a type of regression that can be used to model the following situations:

1. Exponential growth: Growth begins slowly and then accelerates rapidly without bound.



2. Exponential decay: Decay begins rapidly and then slows down to get closer and closer to zero.



The equation of an exponential regression model takes the following form:

$$y = ab^x$$

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 exponential regression in R.

Step 1: Create the Data

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

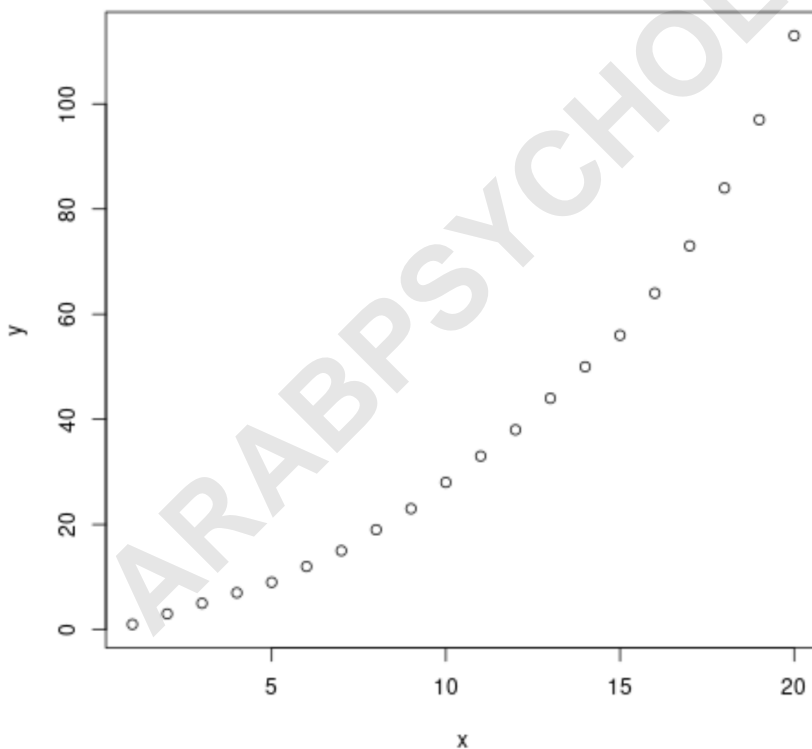
x=1:20

y=c(1, 3, 5, 7, 9, 12, 15, 19, 23, 28, 33, 38, 44, 50, 56, 64, 73, 84, 97, 113)

Step 2: Visualize the Data

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

plot(x, y)



Thus, it seems like a good idea to fit an exponential regression equation to describe the relationship

between the variables.

Step 3: Fit the Exponential Regression Model

Next, we'll use the `lm()` function to fit an exponential regression model, using the natural log of y as the and x as the predictor variable:

```
#fit the model
```

```
model <- lm(log(y)~ x)#view the output of the model
summary(model)
```

Call:

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

Residuals:

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

```
-1.1858 -0.1768 0.1104 0.2720 0.3300
```

Coefficients:

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

```
(Intercept) 0.98166 0.17118 5.735 1.95e-05 ***
```

```
x 0.20410 0.01429 14.283 2.92e-11 ***
```

```
---
```

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

Residual standard error: 0.3685 on 18 degrees of freedom

Multiple R-squared: 0.9189, Adjusted R-squared: 0.9144

F-statistic: 204 on 1 and 18 DF, p-value: 2.917e-11

The of the model is 204 and the corresponding p-value is extremely small (2.917e-11), which indicates that the model as a whole is useful.

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

$$\ln(y) = 0.9817 + 0.2041(x)$$

Applying e to both sides, we can rewrite the equation as:

$$y = 2.6689 * 1.2264x$$

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 30.897:

$$y = 2.6689 * 1.2264^{12} = 30.897$$

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

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