Tecnológico de Monterrey

TEC21

ECONOMETRIC MODELS
FZ2019

Elements and generation of a Linear Regression Model

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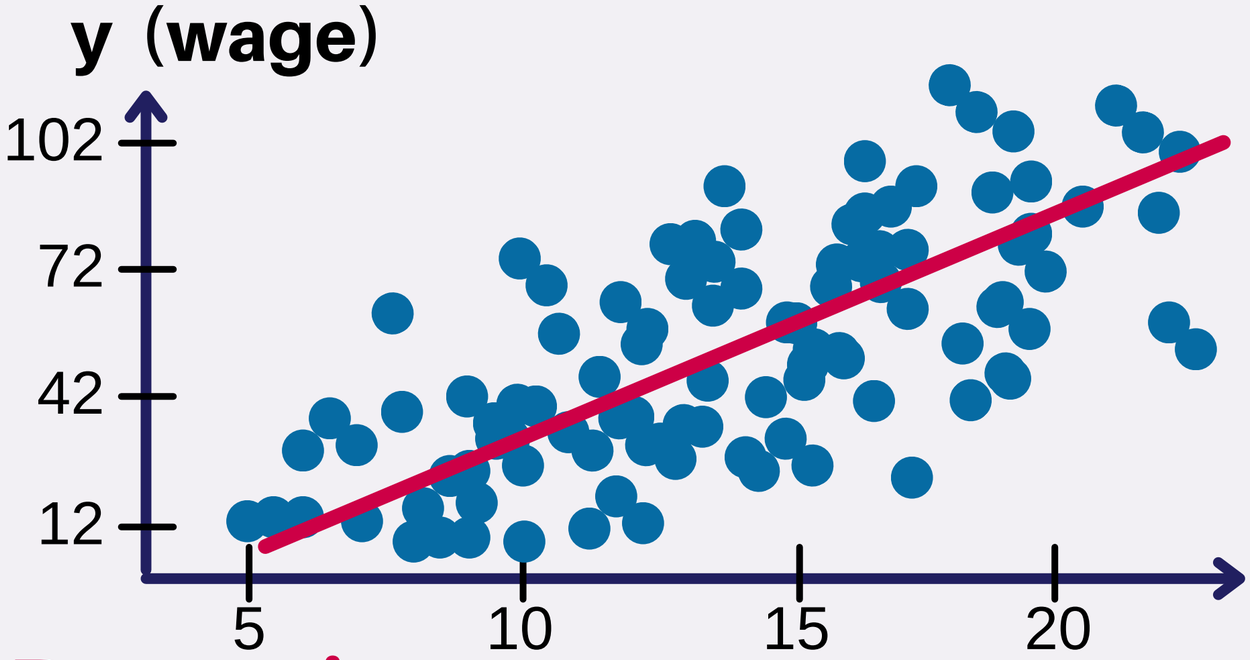
Background (Example 1)



Linear Regression Model

$$wage = ß_0 + ß_1 education + u$$

$$y = ß_0 + ß_1 x + u$$

Regression is a mathematical method that helps describe the behavior of the dependent variable with respect of the independent(s) using a curve.

Linear Regression is a regression in which the relationship between the variables is linear (first degree), thus, its equation resembles the linear equation form y=mx+b

$$y = \beta_0 + \beta_1 x + u$$

β_0: Intercept with the vertical axis; it is the theoretical (or real) value of the dependent variable, when the independent variable is 0 (zero).

In this example, it is the wage that a person with no education would earn per hour.

β_1: Effect of the independent variable in the behavior of the dependent variable. The greater the value of this coefficient, the stronger the effect. Also, its sign determines if this effect is positive or negative.

In this example, it is the number of dollars per hour that the wage increases/decreases per each year of formal education that you study.

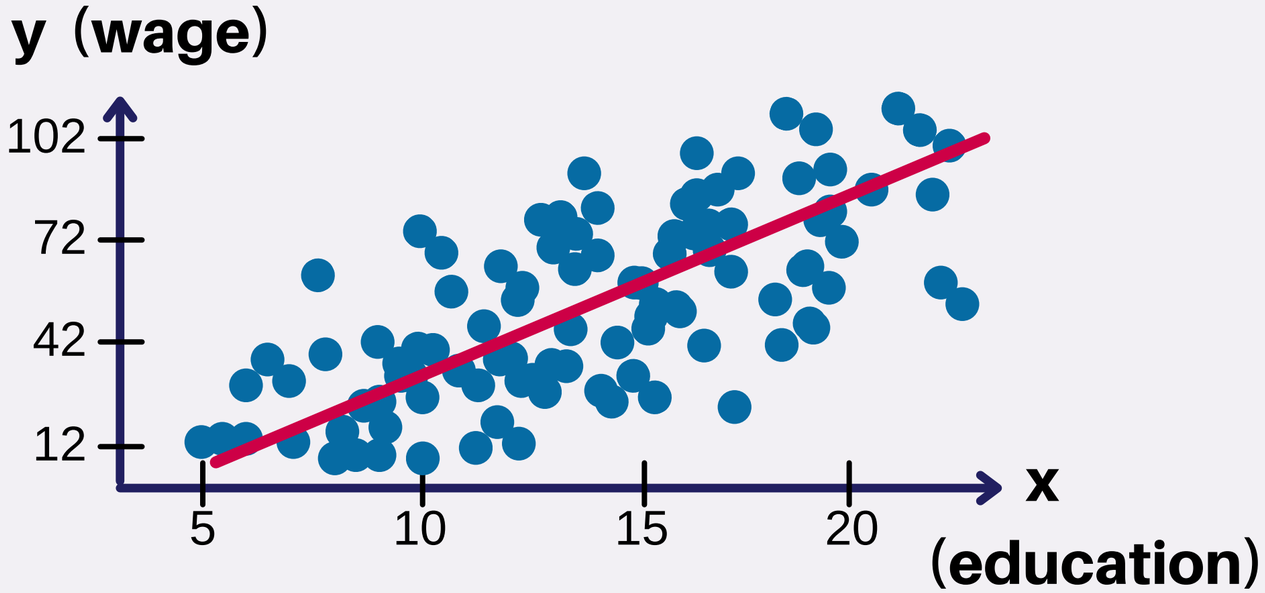
But, what about the "u"?

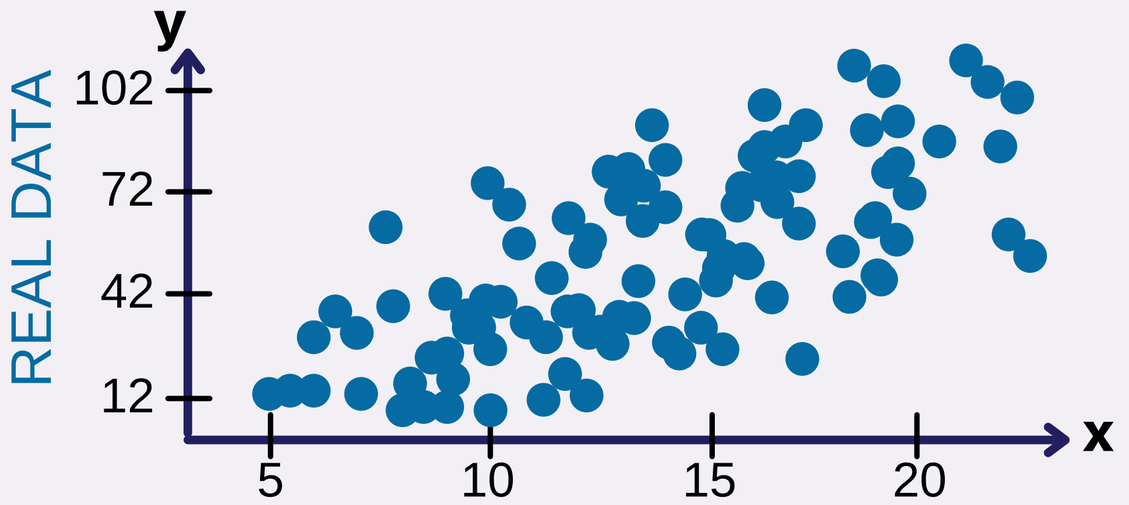
$$y = \beta_0 + \beta_1 x + u$$

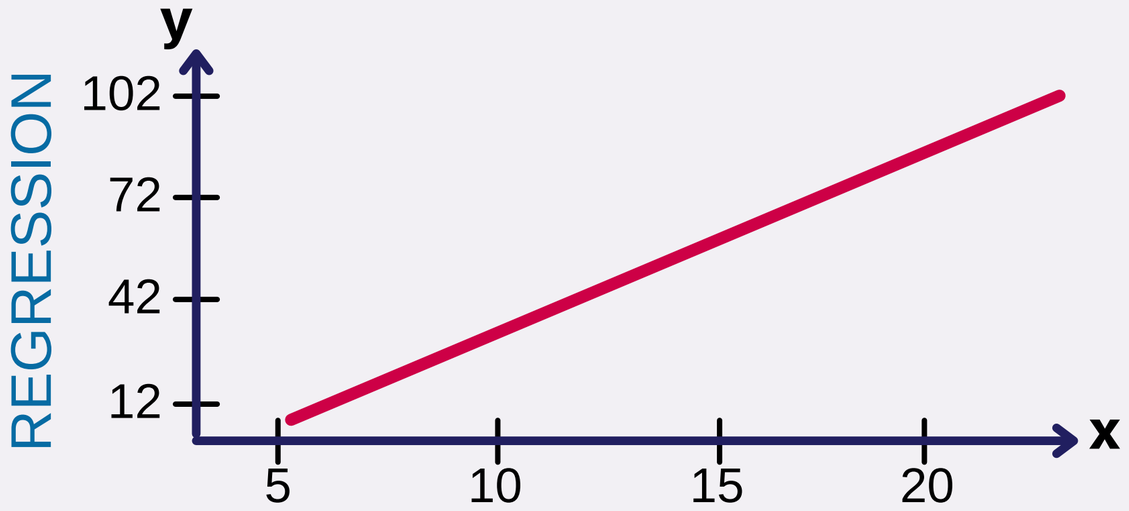
In our example, it represents any other phenomenon that might cause a person to earn more or less dollars per hour.

This is called the "error" term or disturbance. It summarizes all the other elements that can have an effect on the behavior of the dependent variable, other than "x".

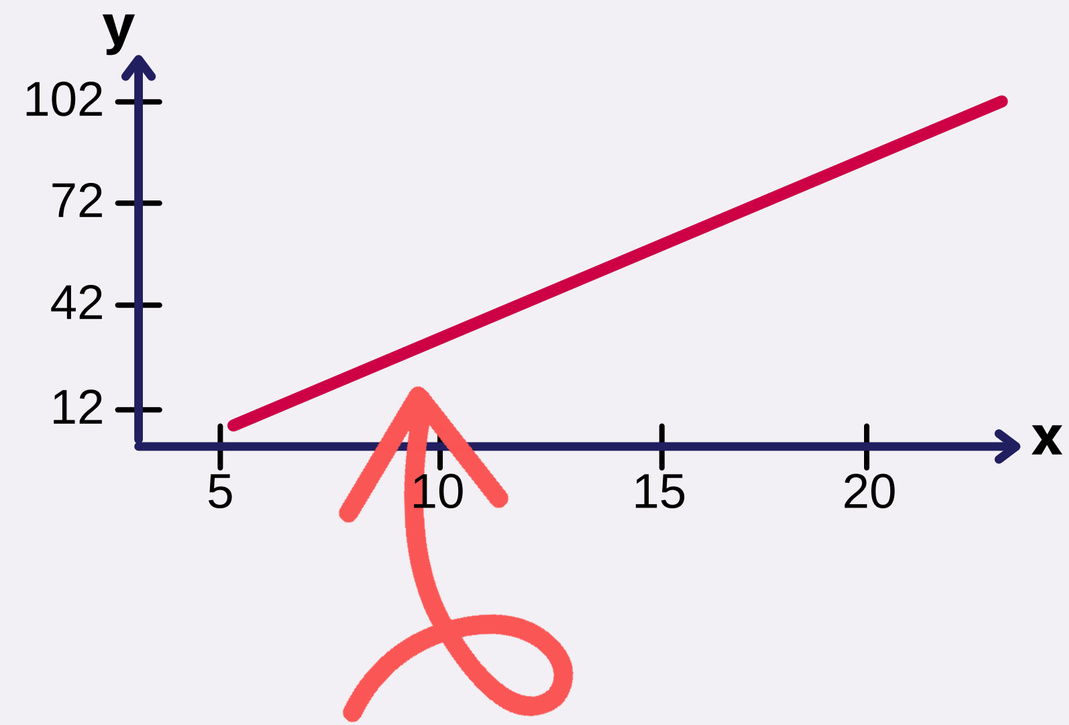
$$y = \beta_0 + \beta_1 x + u$$





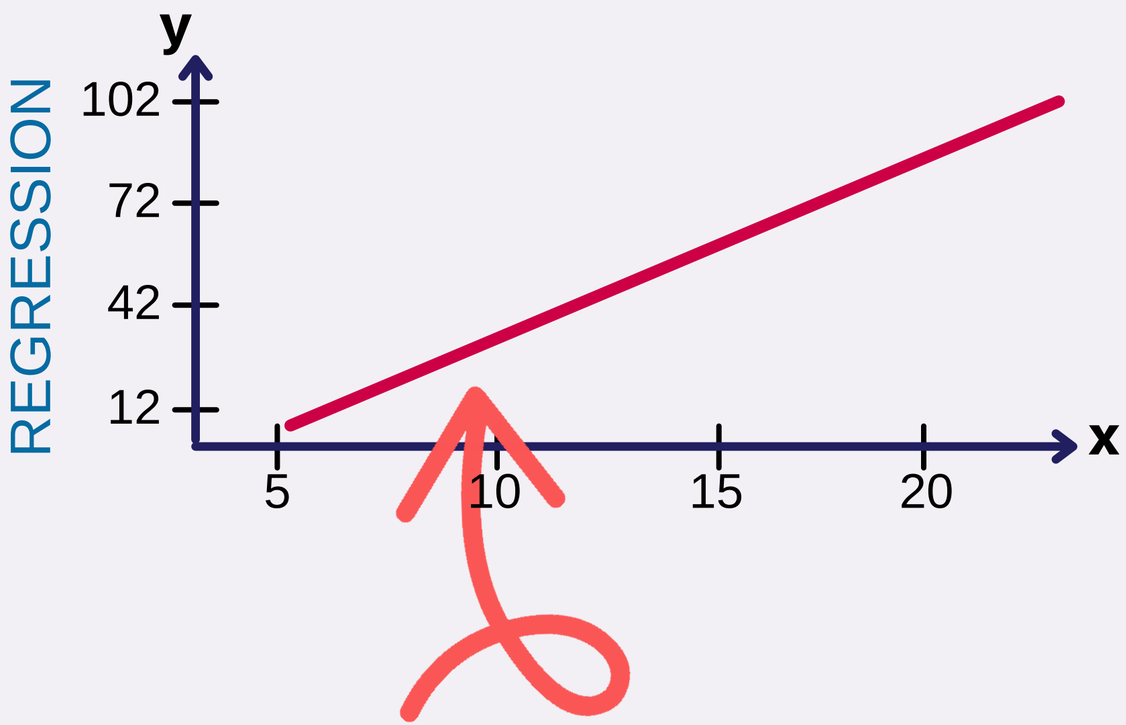


REGRESSION



$$y_i = -25 + 6x_i$$

For example, a person with 10 years of formal education.



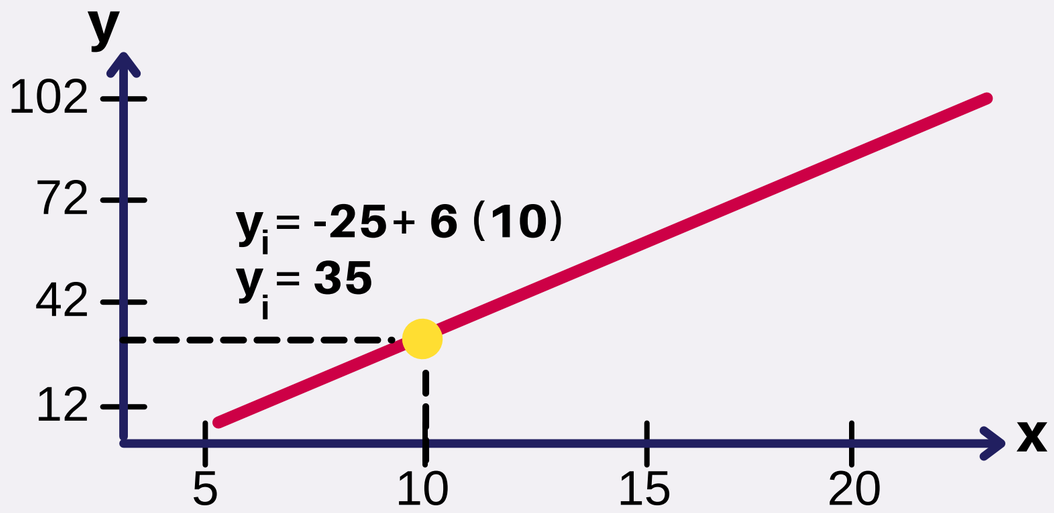
$$y_i = -25 + 6x_i$$

For example, a person with 10 years of formal education.

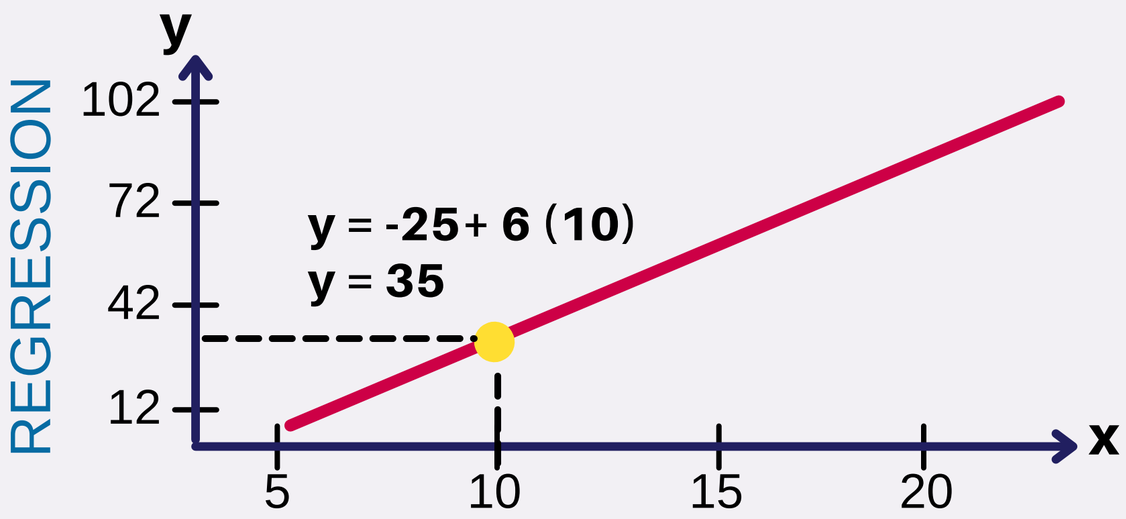
$$y_i = -25 + 6(10)$$

$$y_i = 35$$

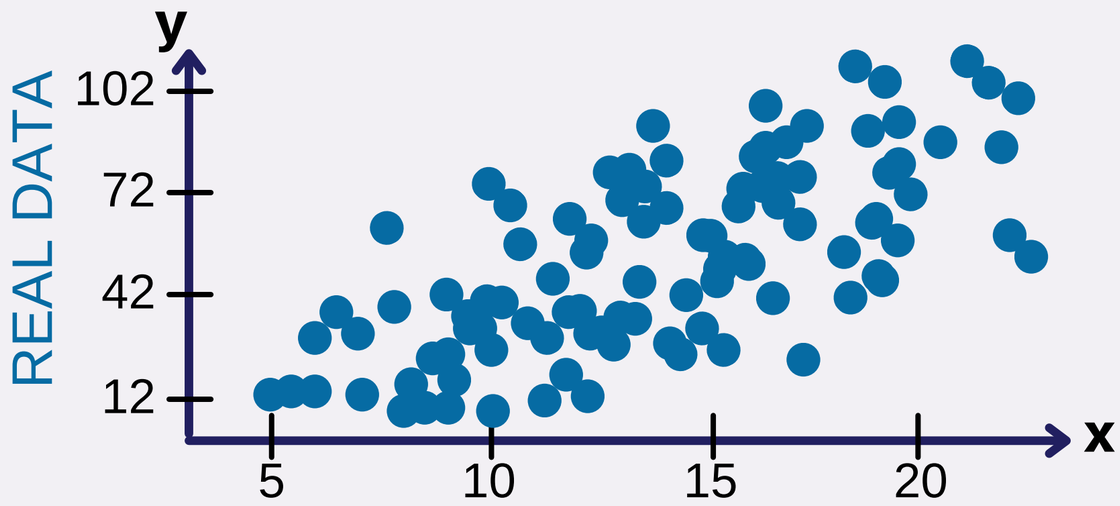
REGRESSION

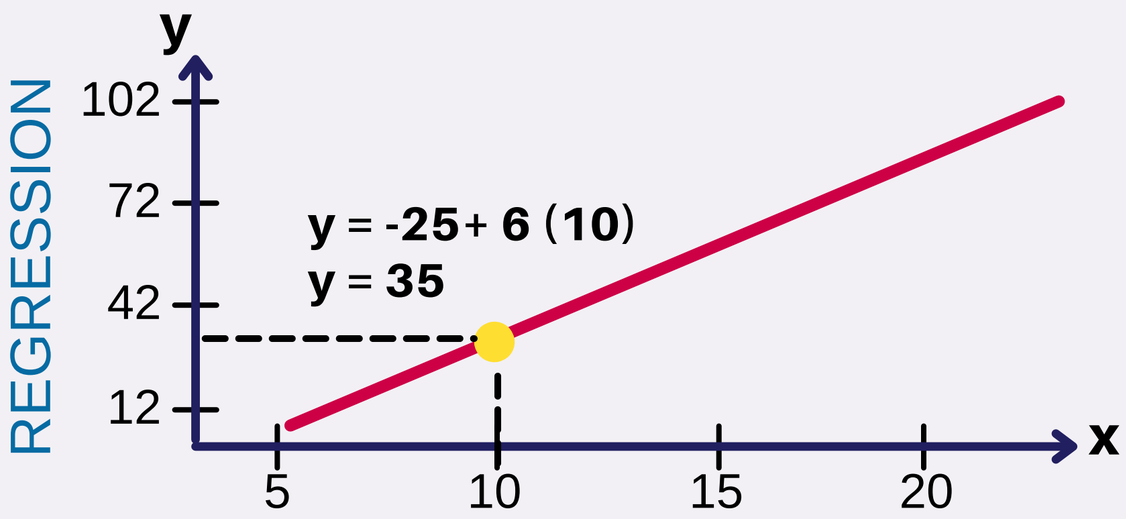


$$y_i = -25 + 6\,x_i$$


REGRESSION
y
102
72
42
12
y = -25+ 6 (10)
y = 35
x
5
10
15
20

$$y_i = -25 + 6\,x_i$$


REAL DATA
y
102
72
42
12
x
5
10
15
20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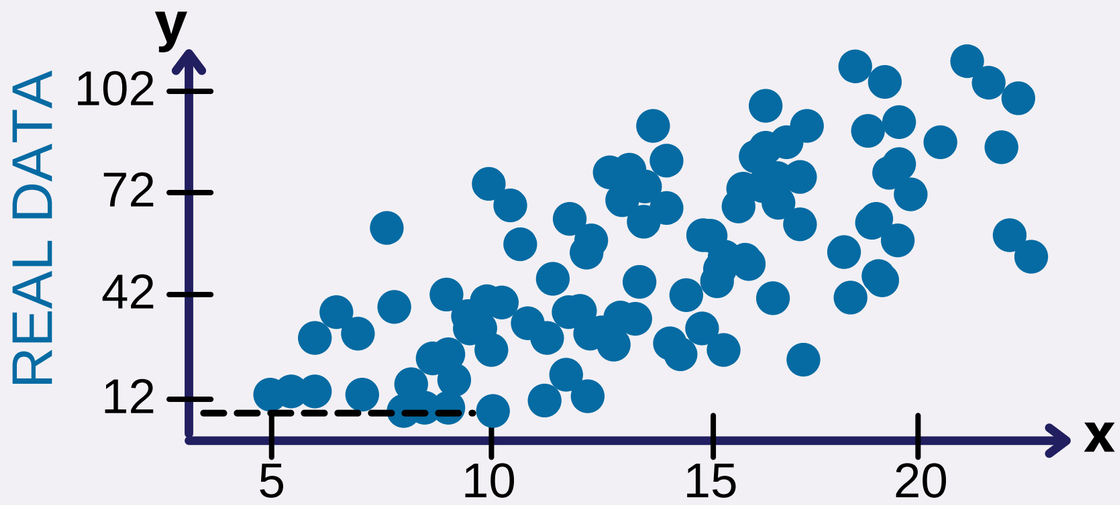
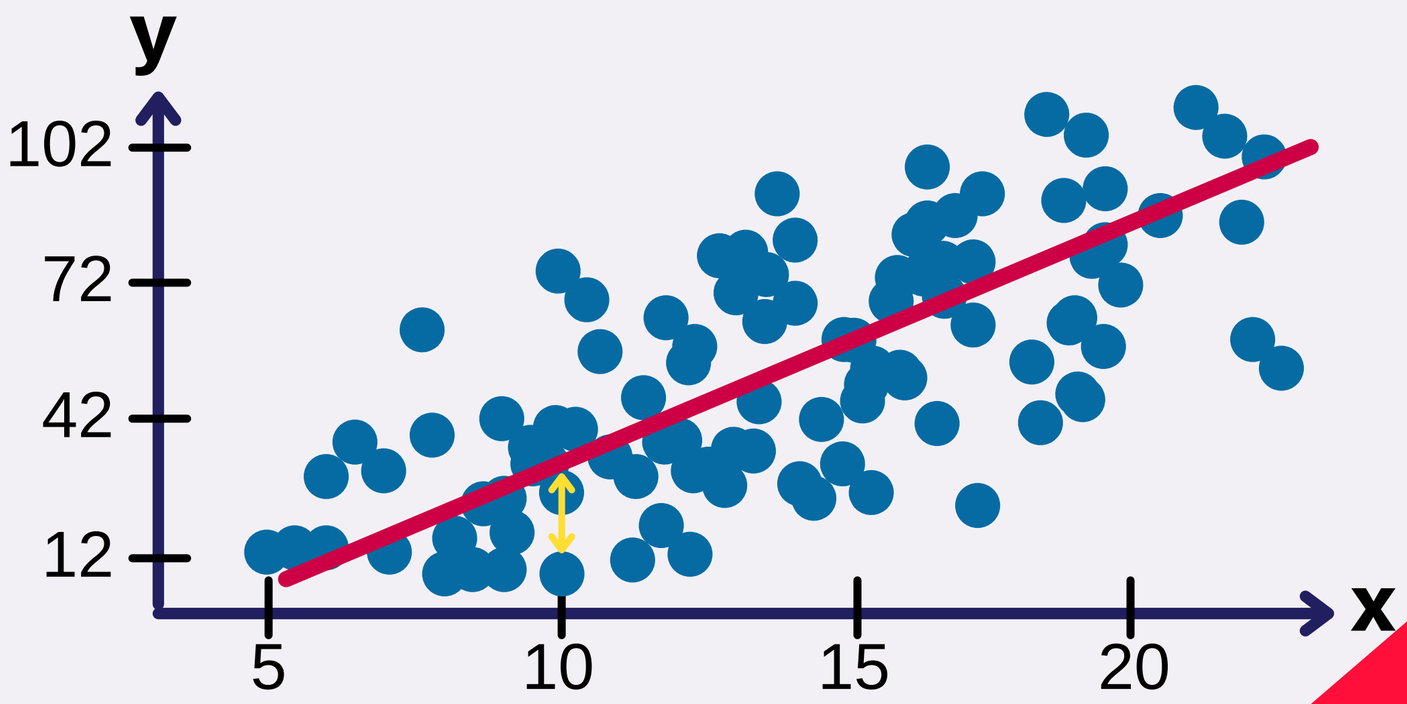
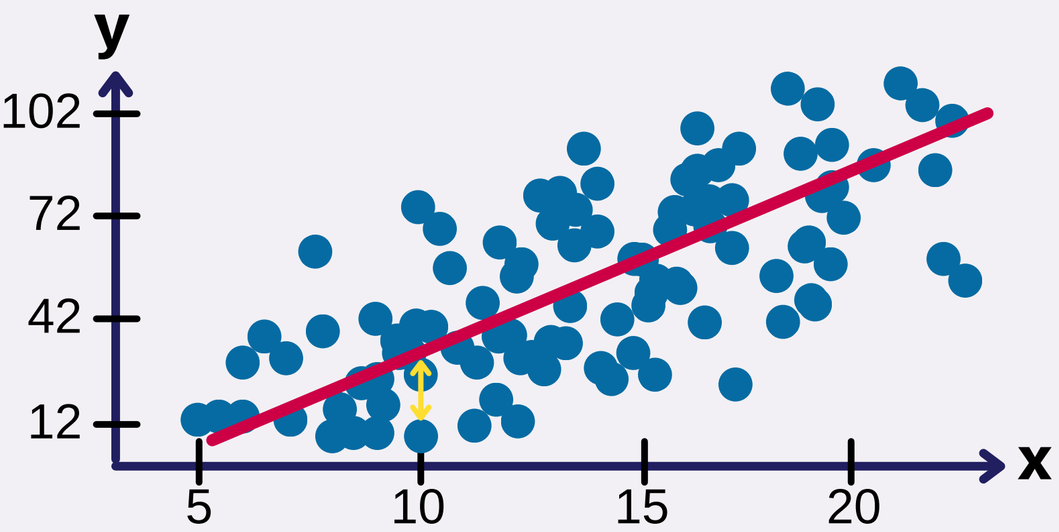
$$y_i = -25 + 6\,x_i$$


REAL DATA
y
102
72
42
12
x
5
10
15
20

"u" or error represents, basically, the differences between the real values obtained in the sample and the values calulated using the regression.



Thus, when calculating a value of the dependent variable, the equation of the model can only get an approximation. This is complemented by the error term.



Although there are many methods for generating the regression this course will be focused in one:

Ordinary Least Squares

This method looks to minimize the sum of the squared differences between the observed values of the dependent variable and the values obtained through the regression.

Simple Regression Model

ONE DEPENDENT VARIABLE

$$y = \beta_0 + \beta_1 x + u$$

ONE INDEPENDENT VARIABLE

Multiple Regression Model

ONE DEPENDENT VARIABLE

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + u$$

"N" INDEPENDENT VARIABLES

BIBLIOGRAPHY

Introductory Econometrics: a modern approach, 7th edition

Jeffrey M. Wooldridge

Cengage Learning