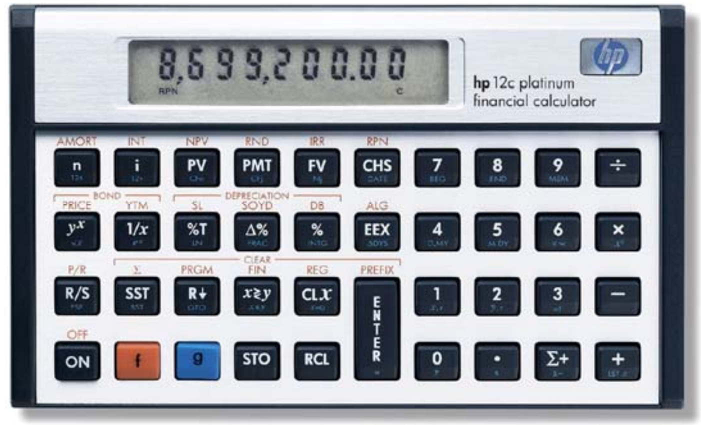
hp calculators

HP 12C Platinum
Statistics - Linear regression



Linear regression

HP12C Platinum Statistics

Practice solving linear regression problems

Linear regression

Linear regression is a statistical method for finding a smooth straight line that best fits two or more data pairs in a sample being analyzed. Any straight line like the one shown in Figure 1 owns two specific coefficients that precisely locate it in a planar coordinate system: a y-intercept A and a slope B. These coefficients compose the straight line equation $y = A + Bx$. It is also important to mention that the correlation $| r |$ is always 1 when only two points are entered.

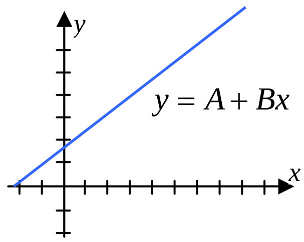


Figure 1

HP12C Platinum Statistics

In the HP12C Platinum, summations resulting from statistics data are suitable for linear regression computations. Given the y and x coordinates of any two or more points belonging to a curve, the linear regression coefficients can be easily found.

Practice solving linear regression problems

<u>Example 1:</u> Based on the information presented in the graphic in Figure 2, compute the y-intercept and slope to characterize the straight line. Note that the line crosses the x-axis at the origin (0,0).

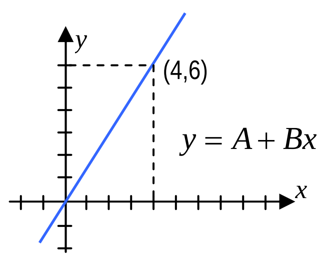


Figure 2

<u>Solution:</u> One of the points that belongs to the curve is (0,0) and the other one is (4,6). Both must be entered to compute the equation of the line. Be sure to clear the statistics / summation memories before starting the problem.

[f] [Σ] [0] [ENTER] [0] [Σ+] [6] [ENTER] [4] [Σ+]

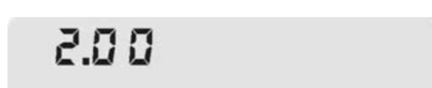


Figure 3

The display shows the number of entries.

Now compute the slope (B) by entering: (Since A is already zero)

[1] [g] [ŷ,r]

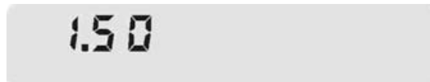


Figure 4

Answer: The expression for this straight line has A=0 and B=1.5. The equation is $y = 1.5x + 0$

Example 2: Based on the information presented in the graphic in Figure 5, compute the y-intercept and slope to characterize the straight line. Then use x-forecasting to compute the x-related coordinate for y=5.

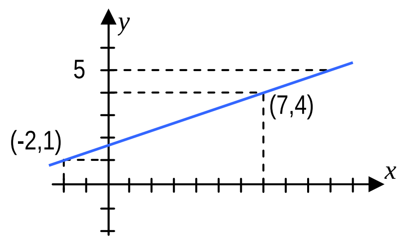


Figure 5

Solution: Be sure to clear the statistics / summation memories before starting the problem.

[f] [Σ]

The data pairs must be entered before computing the coefficients.

[1] [ENTER] [2] [CHS] [Σ+]
[4] [ENTER] [7] [Σ+]

Figure 6

As the line does not cross the x-axis at the origin, we forecast y when x=0 to find the y-intercept A:

[0] [g] [ŷ,r]

Figure 7

To compute the slope, now press:

In RPN mode: [1] [g] [ŷ,r] [x≷y] [R↓] [x≷y] [−]
In algebraic mode: [1] [g] [ŷ,r] [x≷y] [R↓] [−] [x≷y] [=]

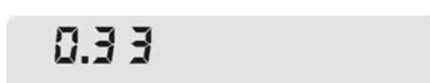


Figure 8

Now it is necessary to forecast x for y=5.

[5] [x̂,r]

Figure 9

Answer: This straight line has A=1.67 and B=0.33 and its expression is: $y = 1.67 + 0.33x$

Example 3: Linear programming is a common technique used to solve operational research problems by graphics inspection. Based on the information presented in the graphics in Figure 10, compute the y-intercept and slope for both straight lines S_1 and S_2.

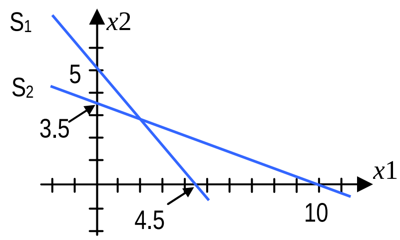


Figure 10

Solution: Be sure to clear the statistics / summation memories before starting the problem.

[f] [Σ]

By inspection, the y-intercept for both lines is found to be 3.5 for S_1 and 5 for S_2. Now we need to compute their slope. The data pairs for S_1 are (10,0) and (0,3.5):

[0] [ENTER] [1] [0] [Σ+] [3] [•] [5] [ENTER] [0] [Σ+]

Figure 11

The slope for S_1 can be found with the following sequence:

In RPN mode: [0] [g] [ŷ,r] [CHS] [1] [g] [ŷ,r] [x≷y] [R↓] [+]
In algebraic mode: [0] [g] [ŷ,r] [1] [g] [ŷ,r] [x≷y] [R↓] [−] [x≷y] [=]

Figure 12

Now, to compute S_2 slope it is necessary to clear the statistics / summation memories and enter (5,0) and (0,4.5) as the new data pairs.

[f] [Σ] [0] [ENTER] [5] [Σ+] [4] [•] [5] [ENTER] [0] [Σ+]

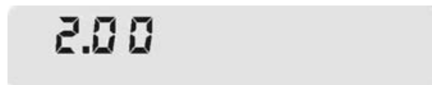


Figure 13

The slope for S_2 can be found with the same sequence as before:

In RPN mode: [0] [g] [ŷ,r] [CHS] [1] [g] [ŷ,r] [x≷y] [R↓] [+]
In algebraic mode: [0] [g] [ŷ,r] [1] [g] [ŷ,r] [x≷y] [R↓] [−] [x≷y] [=]

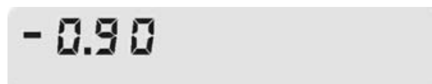


Figure 14

Answer: For S_1, A = 3.5 and B = -0.35. For S_2, A = 5 and B = -0.90.

$$S_1 \Rightarrow y = 3.5 - 0.35x \qquad S_2 \Rightarrow y = 5 - 0.90x$$