Week-04-L-06

Agricultural Statistics in Practice

Regression Path Analysis

MS Excel Program for determination of regression path coefficients

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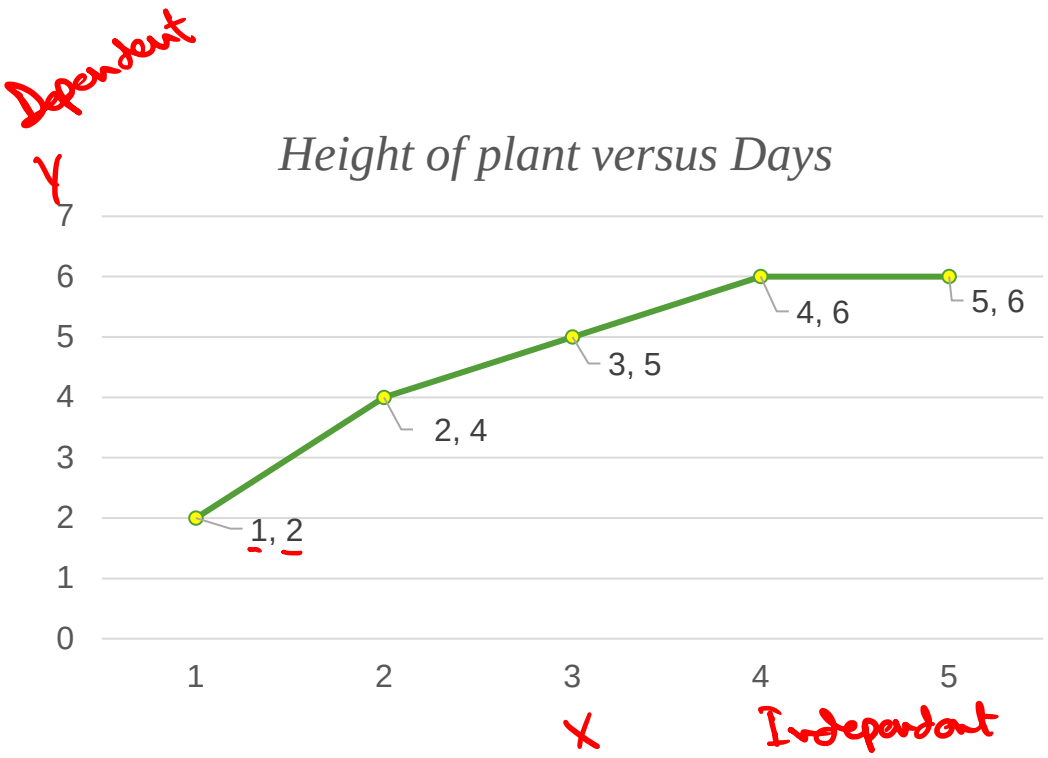
Example

- Assume, we have data for height of a plant for 5 consecutive days, to measure the impact of a ***growth booster fertilizer*** on the plant.

Day	*Height (m)*
1	2
2	4
3	5
4	6
5	6

Solution

- We've the data as given below.
- We'll now plot all these value in a graph with the axes as shared

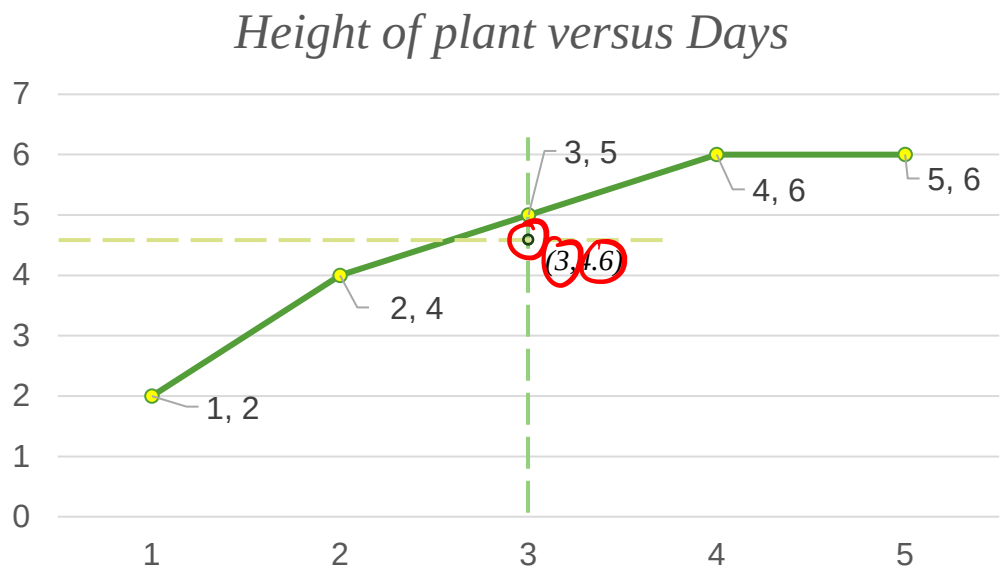


Independent. Dep.

Day	Height (m)
1	2
2	4
3	5
4	6
5	6

Solution

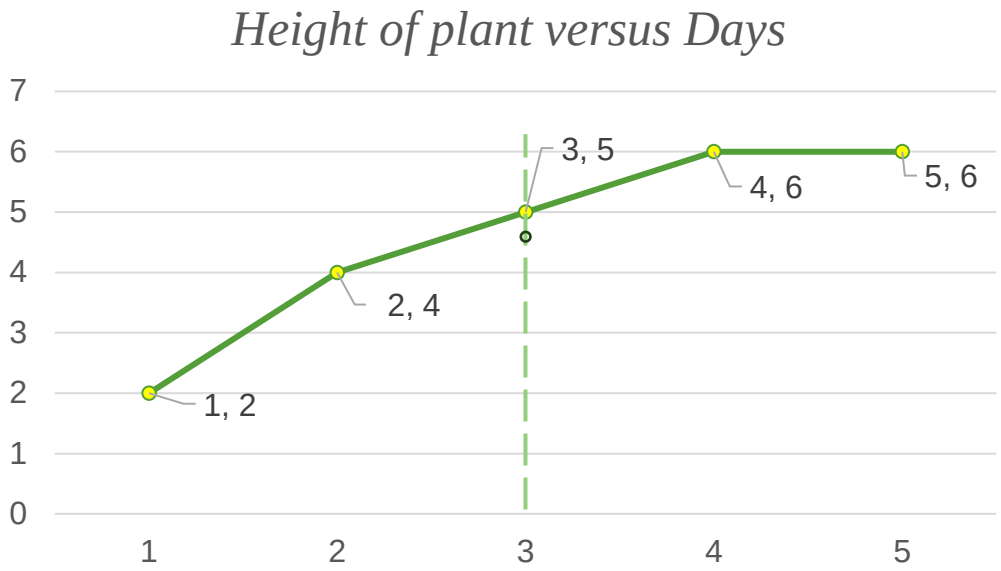
- Now we'll take mean of the x values, which is 3 and mark it in the graph, similarly for y values as well
- All our regression lines will pass through the point (3,4.6)



Day	Height (m)
1	2
2	4
3	5
4	6
5	6
Mean 3	4.6

Solution

- So we now calculate the distance between each of the points and the mean from ***respective*** axis, first we'll go for x-axis & will note the values in the table.



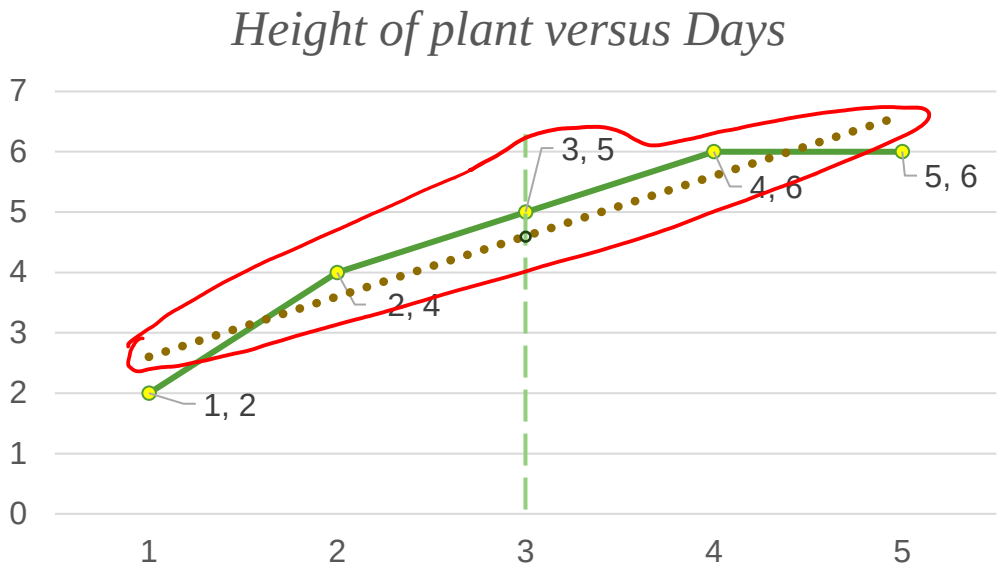
Day	*Height (m)*	$x - \bar{x}$	$y - \bar{y}$
1	2	1 – 3 = – 2	2 – 4.6 = – 2.6
2	4	2 – 3 = –1	4 – 4.6 = – 0.6
3	5	3 – 3 = 0	5 – 4.6 = 0.4
4	6	4 – 3 = 1	6 – 4.6 = 1.4
5	6	5 – 3 = 2	6 – 4.6 = 1.4

Solution

- So now we'll move to find b_1 i.e. slope of the line of the equation:

$$\hat{y} = \boldsymbol{b_0} + \boldsymbol{b_1 x}$$

- So we calculate $(\boldsymbol{x} - \overline{\boldsymbol{x}})^2$ &$(\boldsymbol{x} - \overline{\boldsymbol{x}}) \times (\boldsymbol{y} - \overline{\boldsymbol{y}})$



Day	*Height (m)*	$x - \overline{x}$	$y - \overline{y}$
1	2	1 – 3 = – 2	2 – 4.6 = – 2.6
2	4	2 – 3 = –1	4 – 4.6 = – 0.6
3	5	3 – 3 = 0	5 – 4.6 = 0.4
4	6	4 – 3 = 1	6 – 4.6 = 1.4
5	6	5 – 3 = 2	6 – 4.6 = 1.4

Solution

- $\hat{y} = b_0 + b_1 x$
- Calculating $(x - \bar{x})^2$ &$(x - \bar{x}) \times (y - \bar{y})$

Day	*Height (m)*	$x - \bar{x}$	$y - \bar{y}$	$(x - \bar{x})^2$	$(x - \bar{x}) \times (y - \bar{y})$
1	2	1 – 3 = – 2	2 – 4.6 = – 2.6	4	5.2
2	4	2 – 3 = –1	4 – 4.6 = – 0.6	1	0.6
3	5	3 – 3 = 0	5 – 4.6 = 0.4	0	0
4	6	4 – 3 = 1	6 – 4.6 = 1.4	1	1.4
5	6	5 – 3 = 2	6 – 4.6 = 1.4	4	2.8
			Sum	10	10

- $b_1 = \frac{\sum(x-\bar{x})\times(y-\bar{y})}{\sum(x-\bar{x})^2} = \frac{10}{10} = 1$
- $y = the\ intercept\ value\ which\ is\ 4.6$
- Hence, we can find the value of b_0 via linear algebra

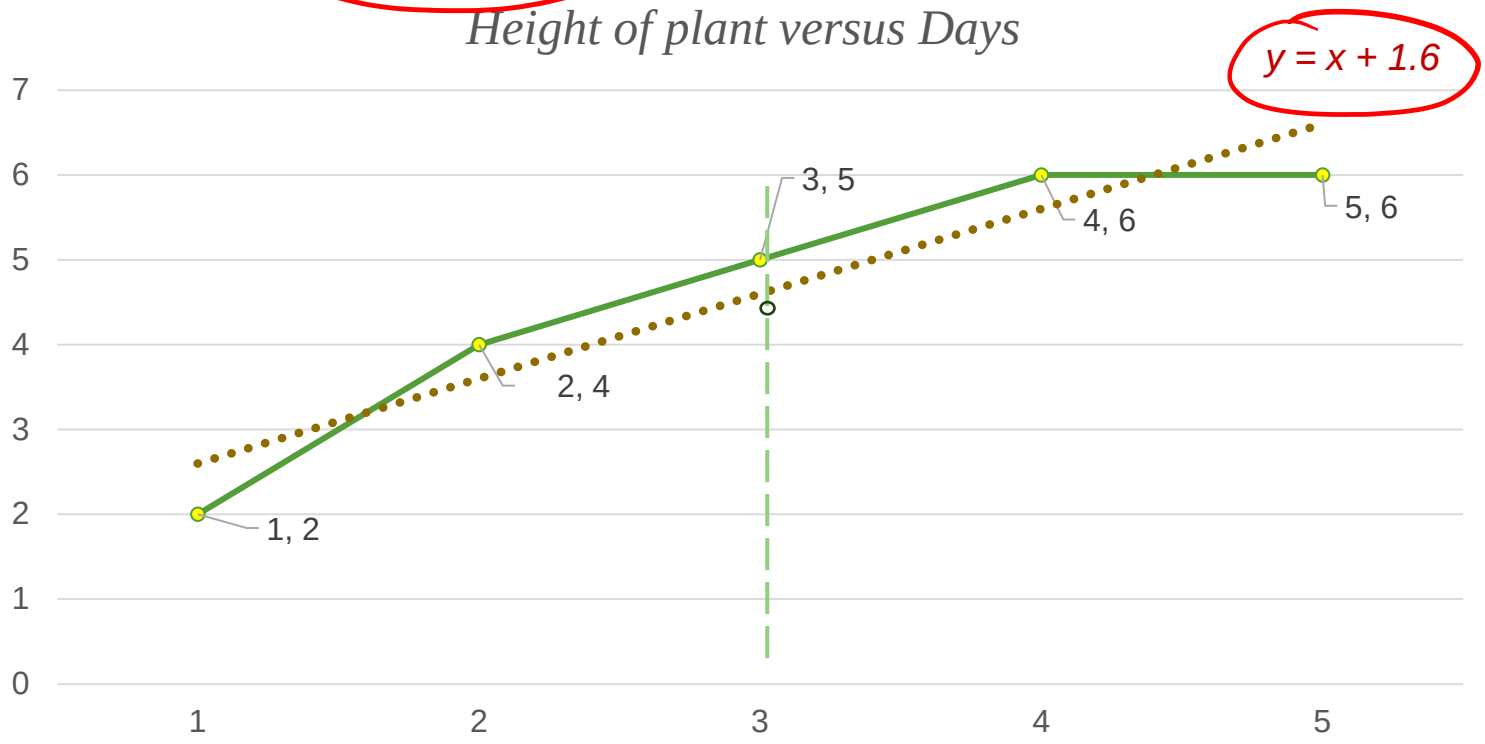
Solution

- $\hat{y} = b_0 + b_1 x$

→ 4.6 = b_0 + 1 x 3

→ b_0 = 1.6

- *Hence, our final equation is* $\hat{y} = 1.6 + 1\,x$



Thank You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