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16/ENG06/069

Given $d = \alpha\beta^t$

Comparing eqn ① to $y = mx + c$

$\log(1) = \log\alpha + t\log\beta$

where $a_0 = \log\alpha$

$a_1 = \log\beta$

$y = \log x$

	$y = \log d$	$t = x$	xy	d(m)	x^2	y^2
1)	0.301029996	0	0	0	0	0.09061905
2)	0.698970004	1	0.698970004	1	1	0.488559067
3)	1.278753601	2	2.557507202	2	4	1.635210772
4)	1.698970004	3	5.096910003	3	9	2.886499076
5)	2.178976947	4	8.715907789	4	16	4.747940597
6)	2.672097858	5	13.36048929	5	25	7.140106962
7)	3.156851901	6	18.9411142	6	36	9.965713925
8)	3.654369091	7	25.58058364	7	49	13.35441345
9)	4.111800007	8	32.89440006	8	64	16.3544 1345
10)	4.614163911	9	41.5269532	9	81	21.28997336
11)	5.045405135	10	50.45405135	10	100	25.4611297

$\Sigma y = 29.4113046$

$\Sigma x = 55$

$\Sigma xy = 199.8268889$

$\Sigma x^2 = 385$

$\Sigma y^2 = 103.9620485$

$\Sigma y^2 = a_0 N + a_1 \Sigma x$

$29.41133046 = a_0(11) + a_1(55)$

$\Sigma xy = a_0 \Sigma x + a_1 \Sigma x^2$

$199.8268829 = a_0(55) + a_1(385) \quad \ldots (2)$

Solving eqn (1) and eqn (2)

$29.41133046 = 11a_0 + 55a_1$

$199.8268839 = 55a_0 + 385a_1$

$$a_0 = \frac{\begin{vmatrix} 29.41133046 & 55 \\ 199.5268839 & 385 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}}$$

$$= \frac{(29.41133046)(385) - (55)(199.8268839)}{(11 \times 385) - (55 \times 55)}$$

$a_0 = 0.27511$

$$a_1 = \frac{\begin{vmatrix} 11 & 29.41133046 \\ 55 & 199.826885 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}}$$

$$a_1 = \frac{(11 \times 199.826835) - (29.41133046 \times 55)}{(11 \times 385) - (55 \times 55)}$$

$a_1 = 0.47973$

$a_0 = \log \alpha$

$0.27511 = \log \alpha$

$\alpha = 1.841$

$a_1 = \log \beta$

$0.47973 = \log \beta$

$\beta = 3.0181$

$\alpha = 1.8841 \quad \beta = 3.0181$

d) Correlation Coefficient

$$R = \frac{N\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{N\Sigma x^2 - (\Sigma x^2)}\,(N\Sigma x^2 - (\Sigma y)^2)}$$

$$R = \frac{(11 \times 199.8268839) - 55(29.41133046)}{\sqrt{(11 \times 385 - 55^2) \times [11 \times 103.9620485 - (29.4113046)^2]}}$$

$R = 0.99984483 12$

$R_{square} = (0.99984483 12)^2$

$= 0.9996896867$

For Maual Method

$R = 0.999844312$

$R^2 = 0.99968896864$

For Matlab;

$R = 0.9998$

$R^2 = 0.9997$

For Excel

$R = 0.999844483235763$

$R^2 = 0.99968896887922257$

d) From observation for all the Methods used to solve the Correlation Coefficient and its square, it can be seen that $R^2 < R$ i.e the value of the square of the Correlation Coefficient is lesser than the actual value of the Correlation Coefficient.