Ebiku Paul Alsiro
17/ENG06/095 ENG 382 Mechanical Eng

Given $d = \alpha\beta^t$

Comparing eqn ① to $y = a_0 + a_1 x$

$\log d = \log\alpha + t\log\beta$

where $a_0 = \log\alpha$

$a_1 = \log\beta$

$y = \log d$

	$y = \log d$	$t = x$	xy	$d(n)$	x^2	y^2
)	0.301029996	0	0	0	0	0.09061905
)	0.69897004	1	0.69897004	1	1	0.488559067
)	1.27875601	2	2.557507202	2	4	1.635216774
)	1.69897004	3	5.09691003	3	9	2.88649974
)	2.17897697	4	8.71590789	4	16	4.74794059
)	2.67209781	5	13.36048129	5	25	7.14010462
)	3.15688191	6	18.94111142	6	36	9.96591925
)	3.65456091	7	25.58088864	7	49	13.35594135
)	4.11180007	8	32.89440006	8	64	16.90691398
)	4.61416911	9	41.52470932	9	81	21.28997386
)	5.04540595	10	50.4540935	10	100	25.4611297

$\Sigma y = 29.413046$

$\Sigma x = 55$

$\Sigma xy = 199.8268859$

$\Sigma x^2 = 385$

$\Sigma y^2 = 103.9620485$

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

$29.4133046 = a_0(11) + a_1(55)$

$\Sigma xy = a_0 \Sigma x_1 + a_1 \Sigma x^2$

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

Solving eqn (1) and eqn (2)

$29.4113046 = 11a_0 + 55a_1$

$199.8268839 = 55a_0 + 385a_1$

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

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

$a_0 = 0.27511$

$$a_1 = \frac{\begin{vmatrix} 11 & 29.41133046 \\ 55 & 199.826835 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}}$$

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

$a_1 = 0.47923$

$a_0 = \log \alpha$

$0.27511 = \log \alpha$

$\alpha = 1.841$

$a_1 = \log \beta$

$0.47973 = \log \beta$

$\beta = 3.0181$

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

d) Correlation Coefficient

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

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

$R = 0.999844312$

$R_{square} = (0.999844312)^2$

$= 0.999689686$

Scanned by CamScanner

For Maual Method

$R = 0.999844312$

$R = 0.9996896864$

For Matlab;

$R = 0.9998$

$R^2 = 0.9997$

For Excel

$R = 0.999844483235763$

$R^2 = 0.99968968879 2257$

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