Assignment 1

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ENG382

Given $d = ae^{t}$ ...
Comparing eqn i to $y = mx + c$
$\log d = \log a + \log B$
where $a_0 = \log \alpha$
$a_1 = \log B$

$y = \log d$	$t = x$	$d(m)$	xy	x^2	y^2
		0	0	0	0.09061905
0.301029996	0			1	0.488559067
0.698970004	1	1	0.69897004	4	1.635210772
1.278753601	2	2	2.557507202		
1.69897004	3	3	5.096910013	9	2.886499026
2.178976947	4	4	8.715907789	16	4.747940537
2.672097858	5	5	13.36048929	25	7.1401692
3.1568519091	6	6	18.941141	36	9.965713925
3.654369091	7	7	25.58058364	49	13.35441343
4.111800001	8	8	32.89440006	64	16.9068995
4.614165911	9	9	41.5267582	81	12.28997336
5.045405135	10	10	50.4540985	100	25.45611297

$\therefore \Sigma y = 29.41133046$

$\Sigma x = 55$

$\Sigma xy = 199.8268839$

$\Sigma x^2 = 385$

$\Sigma y^2 = 103.9620485$

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

$29.41133046 = a_0(11) + a_1(55) \quad ---(1)$

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

$199.8268839 = a_0(55) + a_1(385) \quad ---- \quad (2).$

Solving equation ① and ②.

$29.41133046 = 11a_0 + 55a_1$

$199.8268839 = 55a_0 + 385a_1$

$$a_0 = \frac{\begin{vmatrix} 29.41133046 & 55 \\ 199.8368839 & 385 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}}$$

$$29.41133046\,(385) - (55)(199.8868839)$$
$$(11\times 385) - (55\times 55)$$

$\therefore\ a_0 = 0.27511$

$$a_1 = \frac{\begin{vmatrix} 11 & 29.41133046 \\ 55 & 199.8268835 \end{vmatrix}}{\begin{vmatrix} 11 & 55 \\ 55 & 385 \end{vmatrix}}$$

$$\therefore\ \frac{11\times 199.8268835 - (29.4113046\times 55)}{(11\times 385) - (55\times 55)}$$

$a_1 = 0.47973$

$a_0 = \log a$

$0.27511 = \log a$

$a = 1.8841$

$a_1 = \log B$

$0.47975 = \log B$

$B = 3.0181$

$\therefore\ a = 1.8841$

$B = 3.0181$

correlation coefficient.

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

$$R = \frac{(11 \times 199.8268839) - (55)(29.41133046)}{\sqrt{(11 \times 385 - 55^2) \times [(11 \times 103.9620483 - (29.41133046)^2]}}$$

$$\therefore R = 0.998448312$$

$$R_{square} = (0.998448312)^2$$

$$= 0.996896846$$

Anaytical method.

$R =$

R^2

Matlab

$R = 0.998$

$R^2 = 0.997$

Excel

$R = 0.999844832357633$

$R^2 = 0.999689688792257$

d. From observation for all the methods used to solve the correlation coefficient and it's square; It can be seen that $R^2 < R$ (i.e the value of the source of the correlation coefficient is lesser than the actual value of the correlation coefficient.