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16/ENG 07/007
Petroleum Engineering
ENG 382

Assignment VI

Given $d = \alpha\beta t$ - - - (i)

Comparing eqn (i) to $y = mx + c$ converting it into a linear equation

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

$y = a_0 + a_1 x$

Therefore $a_0 = \log\alpha$

$a_1 = \log\beta$

$x = t$

$y = \log d$

$Y = \log d$	$t = X$	XY	$d(cm)$	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) 1.69870004	3	5.096910013	3	9	2.886497076
5) 2.178976947	4	8.715907789	4	16	4.747940537
6) 2.672097858	5	13.36048929	5	25	7.140106962
7) 3.156851909	6	18.94111141	6	36	9.965713925
8) 3.654369091	7	25.58058364	7	49	13.35441345
9) 4.111800007	8	32.8944006	8	64	16.90689993
10) 4.614165911	9	41.52695 32	9	81	21.28997336
11) 5.045405135	10	50.45405135	10	100	25.45611297

$\sum Y = 29.41133046$

$\sum x = 55$

$\sum XY = 199.8268839$

$\sum x^2 = 385$

$\sum Y^2 = 103.9620485$

$\sum Y = a_0 N + a_1 \sum x$

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

$$\sum xy = a_0 \sum x_i + a_1 \sum x^2$$

$$199.8268837 = a_0(55) + a_1(385) \quad \text{--- (ii)}$$

Combining eqn (i) and (ii)

$$29.41133046 = 11a_0 + 55a_1$$

$$199.8268839 = 55a_0 + 385a_1$$

$$a_0 = \frac{\begin{bmatrix} 29.41133046 & 55 \\ 199.8268839 & 385 \end{bmatrix}}{\begin{bmatrix} 11 & 55 \\ 55 & 385 \end{bmatrix}}$$

$$a_0 = \frac{[29.41133046][385] - [55][199.8268839]}{[11 \times 385] - [55 \times 55]} \quad 0.27511$$

$$a_1 = \frac{\begin{bmatrix} 11 & 29.41133046 \\ 55 & 199.8268839 \end{bmatrix}}{\begin{bmatrix} 11 & 55 \\ 55 & 385 \end{bmatrix}}$$

$$a_1 = \frac{(11 \times 199.8268835) - (29.41133046 \times 55)}{(11 \times 385) - (55 \times 55)}$$

$$a_1 = 0.47973$$

$$a_0 = \log \alpha$$

$$0.27511 = \log \alpha$$

$$\alpha = 1.8841$$

$$a_1 = \log \beta$$

$$0.47973 = \log \beta$$

$$\beta = 3.0181$$

Correlation Coefficient

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

$$R = \frac{[11 \times 199.826839] - [55 \times 29.41133046]}{\sqrt{(11 \times 385 - 55^2) \times (11 \times 103.960488) - (29.41133046)}}$$

$R = 0.9998448312$

$R^2 = (0.9998448312)^2 = 0.9996896861$

For the Manual Method

$R = 0.9998448312$

$R^2 = 0.9996896861$

From Excel

$R = 0.99984483235763$

$R^2 = 0.9996896887925 7$

Comment

From the values obtained manually above it is found that the correlation coefficient ranges between 0.8 - 1 (i.e 0.9998)

This entails that the variables (log d & t) correlate effectively.