Regression Tutorial

Eqn $\Rightarrow$

$$y = a + bx$$

Price (x)	Demand(y)	xy	x²
100	20	2000	400 /0000
150	18	2700	22800
200	15	3000	40,000
300	12	3600	90,000
400	09	3600	160,000
500	05	2500	250,000
600	02	1200	360,000
2250	81	18600	932800

$$\Sigma y = na \; b\Sigma x$$

$$81 = 7a + b(2250)$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2$$

$$18600 = a\,2250 + b \times 932500$$

$$a = 722.991$$
$$b = 0.0315$$

$$y = -0.035 + 22.99x$$

(2)

y (c)	x (I)	xy	x^2	$\hat{y}$	$(y-\bar{y})^2$
150	260			158.01	2451.24
70	80			64.41	1943.92
155	240			147.61	1529.59
65	100			74.81	1135.01
110	160			106.01	6.2001
115	180			116.41	62.56
95	140			95.61	106.15
$\Sigma y = 760$				$\Sigma 763.27$	7294.67

$$y = a + bx$$

$$\Sigma y = na + b\Sigma x \quad \cdots (i)$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 \quad \cdots (ii)$$

by solving (i) and (ii)

$$y = 22.81 + 0.52x$$

$$\bar{y} = \frac{760}{7} = 108.5$$

$(y-\bar{y})^2$
1722.25
1482.25
2162.25
1892.25
2.25
42.25
7485.71

$$R^2 = \frac{\Sigma(\hat{y_t}-\bar{y})^2}{(y_t-\bar{y})^2}$$

$$R^2 = \frac{7294.67}{7485.71} = 0.97$$

$R^2 = 0.97$ ie 97% of variation is due to x but is due to other factor.

Q3) $y = a + bx$

$\Sigma y = na + b\Sigma x$

$70 = 10a + b(130) \quad \cdots (1)$

$\Sigma xy = a\Sigma x + b\Sigma x^2$

$949 = a(130) + b(1818) \quad \cdots (11)$

Solving (1) and (11)

$y = 3.04 + 0.304x$

$$S_b = \sqrt{\frac{\Sigma(y_t - \hat{y})^2}{(n-k-1)\Sigma(x_t - \bar{x})^2}}$$

$k = $ no. g independent variable $(k=1)$

$$S_b = \sqrt{\frac{27.34}{8 \times 128}} = 0.16339$$

$t = \dfrac{b}{S_b} = \dfrac{0.304}{0.163} = 1.8161$

$t_{0.05,8} = 2.306 \quad (\text{given})$

$t_{calculated} < t_{tabular} \rightarrow \text{insignificant}$

$1.8161 < 2.306$

Thus relation is in significant

Q4) $\hat{y} = -8.109 + 0.088x$

Range of prediction level

$\Rightarrow \hat{y} \pm t S_e$

$$S_e = \sqrt{\frac{\Sigma(y_t - \bar{y})^2 - b\Sigma(x_t - \bar{x})(y_t - \bar{y})}{(n-k-1)}}$$

$t = 2.132$