Stats & Inferencing Homework #6

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P12.1)

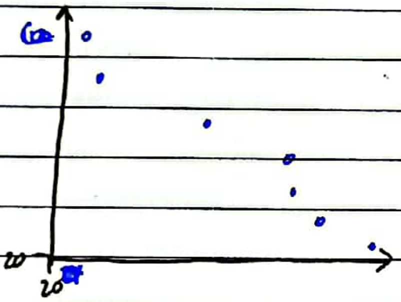
X	4	6	7	11	14	17	21	$\Sigma x =$	80
Y	18	12	13	8	7	7	4	$\Sigma y =$	69
X^2	16	36	49	121	196	289	441	$\Sigma x^2 =$	1148
Y^2	324	144	169	64	49	49	16	$\Sigma y^2 =$	815
XY	72	72	91	88	98	119	84	$\Sigma xy =$	624

$$\text{PPMCC: } r = \frac{\Sigma xy - \frac{1}{n}(\Sigma x \Sigma y)}{\sqrt{\left(\Sigma x^2 - \frac{(\Sigma x)^2}{n}\right)\left(\Sigma y^2 - \frac{(\Sigma y)^2}{n}\right)}} = \frac{624 - \frac{1}{7}(80 \times 69)}{\sqrt{\left(1148 - \frac{(80)^2}{7}\right)\left(815 - \frac{(69)^2}{7}\right)}}$$

PPMCC: $r = -0.9270$

P12.7)

x	140	119	103	91	65	29	24
y	25	29	46	70	88	112	128



→ A simple scatter plot (imagine values please too less space today)

$\Sigma x = 571$ $\quad \Sigma y = 498$ $\quad n = 7$

$\Sigma x^2 = 58293$ $\quad \Sigma xy = 30099$

$SS_{xy} = \Sigma xy - \frac{1}{n}(\Sigma x \Sigma y) = -10520.4$

$SS_{xx} = \Sigma x^2 - \frac{1}{n}(\Sigma x)^2 = 11716$

$b_1 = SS_{xy}/SS_{xx} = -0.8982$

$b_0 = \frac{1}{n}\Sigma y - b_1\left(\frac{1}{n}\Sigma x\right) = 144.414$

$\hat{y} = 144.414 - 0.8982x$

P12.15) Residuals for data ~~provided~~

x	140	119	103	91	65	29	24	$\Sigma x = 571$
y	25	29	46	70	88	112	128	$\Sigma y = 498$

$\hat{y} = 144.414 - 0.8982x$

Then for values of x we get following predicted values:
18.6597, 37.523, 51.895, 62.674, 86.028, 118.365, 122.856

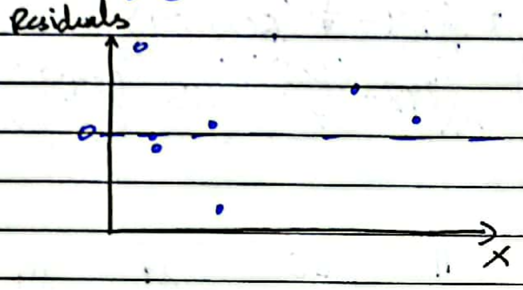
Our Residuals are here $y - \hat{y} =$
6.3403, −8.5229, −5.895, 7.326, 1.972, −6.3648, 5.1439

P12.19) $\hat{y} = 50.506 - 1.646x$ $\quad n = 6$

x	5	7	11	12	19	25	$\Sigma x = 79$	$\Sigma x^2 = 1325$
y	47	38	32	24	22	10	$\Sigma y = 173$	$\Sigma xy = 1809$

Our predicted Values are:
42.276, 38.934, 32.400, 30.751, 19.232, 9.356

Residuals:
4.724, −0.984, −0.400, −6.754, 2.768, 0.644
$\Sigma(y-\hat{y}) = -0.002$ ~~No apparent violations.~~



No apparent violations.

P12.25) Determine SSE & S_e for 12.7
$\Sigma(y-\hat{y})^2 = SSE = 272.12.$
$S_e = \sqrt{\dfrac{272.12}{7-2}} = 7.3773.$

6 out of 7 are within $\pm 1 S_e$
all 7 out of 7 are within $\pm 2 S_e$

P12.33) r^2 for P12.25 (12.27) $\Sigma y^2 = 45145$
$SS_{yy} = 45145 - \frac{1}{7}(498)^2 = 9724.9$
$r^2 = \dfrac{b_1^2 SS_{xx}}{SS_{yy}} = 0.972$

The high value of r^2 shows that the predictor accounts for most of the variability of the dependent variable. 97.2% of variability is explained by variations leaving only 2.8% unaccounted for.

12.39) Slope of regression line for P12.7 $\quad \alpha = 0.01$
$b_1 = -0.8982$ $\quad S_E = 7.3773$ $\quad SS_{xx} = 1716$

$S_b = \dfrac{7.3773}{\sqrt{1716}} = 0.0682$ $\qquad t = \dfrac{-0.8982 - 0}{0.0682} = -13.179$

$t_{\alpha/2, n-2} = \pm 4.0321$
$t < t_{\alpha/2} \Rightarrow$ Reject H_0!

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P12.45) 90% ~~CI~~ PI for y of P12.7 for $x=100$.

90% PI for $x=130$. $\alpha = 0.01$ $\alpha/2 = 0.005$

$t_{\alpha/2, n-2} = \pm$ ~~4.0321~~ 2.015 $\hat{y} \pm t \cdot s_\epsilon \sqrt{1 + \frac{1}{n} + \frac{(x_0-\bar{x})^2}{SS_{xx}}}$

$\hat{y} = 54.5895$.

$x=100$:

$54.5895 - t \cdot 7.3773\sqrt{1+\frac{1}{7}+\frac{(100-81.5714)^2}{SS_{xx}}} \leq E(y_{100}) \leq - - -$

38.4973 ~~[illegible]~~ $\leq E(y_{100}) \leq$ ~~[illegible]~~ 70.6817

~~$x=130$: $-4.5586 \leq E(y_{130}) \leq 59.8430$~~

$x=130$: $10.4145 \leq E(y_{130}) \leq 44.8698$

For larger values of x, the difference between our interval is greater.