Section 9: cont'd

Wednesday, April 12, 2017 1:33 PM

Calculating the best-fit line:

$$\hat{y} = b_0 + b_1 x$$ the best-fit line

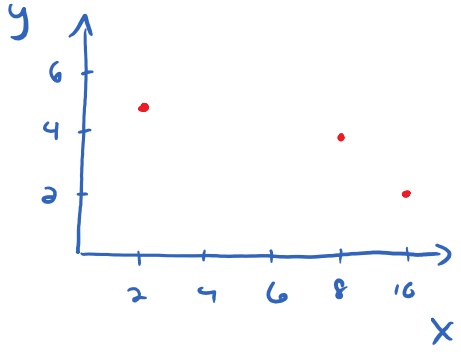
$$b_0 = \bar{y} - b_1 x$$

$$b_1 = \frac{S_{xy}}{S_{xx}}$$

(2) Find $\hat{y}$ and r^2 for the following data set:

x	y
2	5
8	4
9	2

* in real life, you wouldn't know whether to fit this with a straight line (with some scatter) or is it actually a curve?



	x	y	x^2	$x\,y$	y^2
	2	5	4	10	25
	8	4	64	32	16
	9	2	81	18	4
sum	19	11	149	60	45
mean	$19/3$	$11/3$			

$$S_{xx} = \Sigma x^2 - \frac{(\Sigma x)^2}{n} = 149 - \frac{19^2}{3} = \frac{86}{3}$$

$$S_{xy} = \Sigma xy - \frac{(\Sigma x)(\Sigma y)}{n} = 60 - \frac{19 \cdot 11}{3} = \frac{-29}{3}$$

$$S_{yy} = \Sigma y^2 - \frac{(\Sigma y)^2}{n} = 45 - \frac{11^2}{3} = \frac{14}{3}$$

$$b_1 = \frac{S_{xy}}{S_{xx}} = \frac{\frac{-29}{3}}{\frac{86}{3}} = \frac{-29}{3} \cdot \frac{3}{86} = \frac{-29}{86}$$

$$b_0 = \bar{y} - b_1 \bar{x} = \frac{11}{3} - \left(\frac{-29}{86}\right)\left(\frac{19}{3}\right) = \frac{499}{86}$$

$$\hat{y} = b_0 + b_1 x = \underbrace{\frac{499}{86}}_{y\text{-int}} - \underbrace{\frac{29}{86}}_{\text{slope}} x$$

$$r^2 = \frac{(S_{xy})^2}{S_{xx} S_{yy}} = \frac{\left(\frac{-29}{86}\right)^2}{\left(\frac{86}{3}\right)\left(\frac{14}{3}\right)} = \frac{841}{1204} \approx 69.85\%$$

$$r^2 = \frac{(S_{xy})}{S_{xx}\ S_{xy}} = \frac{\left(-\frac{21}{86}\right)}{\left(\frac{86}{3}\right)\left(\frac{14}{3}\right)} = \frac{841}{1204} \approx 69.85\%$$