Simple Linear Regression

y Dependent variable

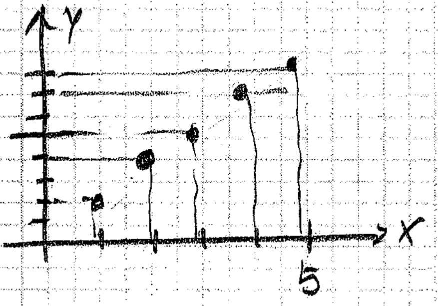
x Independent variable

$$y = \underset{\text{slope}}{m}x + \underset{y\text{-intercept}}{b}$$

$$\hat{y} = \underset{y\text{-intercept}}{\hat{\beta}_0} + \underset{\text{slope}}{\hat{\beta}_1} x \qquad y = b_0 + b_1 x$$

x	y
1	2
2	4
3	5
4	7
5	8

Scatter Plot



Least squares Method

x	y	x^2	y^2	xy
1	2	1	4	2
2	4	4	16	8
3	5	9	25	15
4	7	16	49	28
5	8	25	64	40
ΣX	ΣY	ΣX^2	ΣY^2	ΣXY
15	26	55	158	93

$a = 1.5 \longrightarrow \hat{\beta}_1$

$b = 0.7 \longrightarrow \hat{\beta}_0$

$r = .99 \longrightarrow$ coeff of correlation

$$SS_{xy} = \sum xy - \frac{\sum x \sum y}{n} = 93 - \frac{15 \times 26}{5} = 15$$

$$SS_{xx} = \sum x^2 - \frac{(\sum x)^2}{n} = 55 - \frac{15^2}{5} = 10$$

$$SS_{yy} = \sum y^2 - \frac{(\sum y)^2}{n} = 158 - \frac{26^2}{5} = 22.8$$

$$\bar{x} = \frac{\sum x}{n} = \frac{15}{5} = 3 \qquad \bar{y} = \frac{\sum y}{n} = \frac{26}{5} = 5.2$$

$$\hat{\beta}_1 = \frac{SS_{xy}}{SS_{xx}} = \frac{15}{10} = 1.5$$

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x} = 5.2 - 1.5 \times 3 = 0.7$$

Linear Regression Equation: $\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x$

$$\boxed{\hat{y} = \underset{\substack{\uparrow \\ b \\ \hat{\beta}_0}}{0.7} + \underset{\substack{\uparrow \\ a \\ \hat{\beta}_1}}{1.5}x}$$