

$$\bar{x} = 77.625 \quad \hat{u}_i = y_i - \hat{y}_i$$

$$\bar{y} = 3.2125 \quad \hat{y}_i = 0.5681 + 0.0341x_i$$

		$(x_i - \bar{x})^2$
0.0836	/	0.00699
0.3769	/	0.1419
-0.2279	/	0.0519
0.1698	/	0.0288
0.0652	/	0.0043
0.1256	/	0.0158
-0.4256	/	0.1811
0.0629	/	0.0039
		213.89
		37.64
		0.1406
		11.3906
		87.8906
		6.8906
		6.8906
		153.1406
		511.876

$$\hat{\beta}_1 = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2} = \frac{17.4375}{511.875} = 0.0341$$

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x} = \frac{2.8 + 3.4 + 3 + 3.5 + 3.6 + 3.7 + 3.7 + 3.7}{8} - 0.0341 \left[\frac{63 + 72 + 78 + 81 + 87 + 85 + 95 + 90}{8} \right]$$

$$= 3.2125 - 0.0341(77.625)$$

$$= 0.5681$$

$$\hat{y}_i = 0.5681 + 0.0341x_i$$

$$\sum_{i=1}^8 y_i - \hat{y}_i = 0.0039 \approx 0$$

$$s^2 = \text{var}(\hat{u}_i) = \frac{\sum \hat{u}_i^2}{n-2} = \frac{0.43469}{8-2} = 0.0725$$

$$\text{var}(\hat{\beta}_1) = \frac{s^2}{\sum x_i^2} = \frac{s^2}{\sum (x_i - \bar{x})^2} = \frac{0.0725}{811.876} = 0.0000916$$

$$\text{var}(\hat{\beta}_0) = \frac{\sum x_i^2}{n \sum x_i^2} s^2 = \frac{(48717)(0.0725)}{(8)(811.876)} = 0.0625$$

n=10

$$\hat{y}_i = -8.8 + 0.895x_i$$

$\bar{x} = 20$
 $\bar{y} = 9.1$
 100
 144
 106
 256
 324
 484
 576
 676
 784
 800

4440

$(x_i - \bar{x})$	$(y_i - \bar{y})$	$(x_i - \bar{x})(y_i - \bar{y})$	$(x_i - \bar{x})^2$	$y_i - \hat{y}$	$\hat{u}_i^2$
-10	-0.1	0.1	100	-0.15	0.0225
-8	-7.1	56.8	64	0.06	0.0036
-6	-4.1	24.6	36	1.27	1.6129
-4	-3.1	12.4	16	0.48	0.2304
-2	-2.1	4.2	4	-0.31	0.0961
2	0.9	1.8	4	-0.83	0.6921
4	0.9	3.6	16	-2.68	7.1824
6	8.9	53.4	36	0.53	0.2809
8	6.9	55.2	64	-0.26	0.0676
10	10.9	109	100	1.95	3.8025
			440		14.091

$$\hat{\beta}_1 = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2} = \frac{394}{440} = 0.895$$

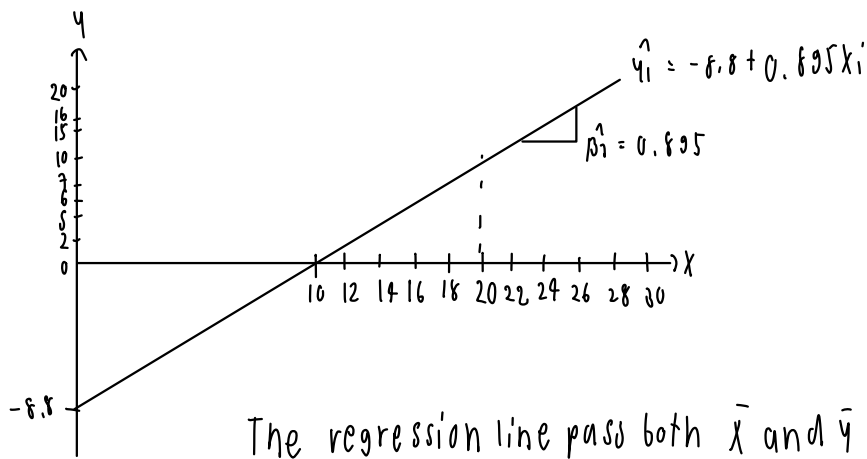
$$\begin{aligned} \hat{\beta}_0 &= \bar{y} - \hat{\beta}_1 \bar{x} = 9.1 - 0.895(20) \\ &= 9.1 - 17.9 \\ &= -8.8 \end{aligned}$$

$$\hat{y}_i = \hat{\beta}_0 + \hat{\beta}_1 x_i$$

$$= -8.8 + 0.895 x_i$$

$$\sum_{i=1}^{10} y_i - \hat{y}_i = -0.15 + 0.06 + 1.27 + 0.48 - 0.37 - 0.80 - 2.68 + 0.53 - 0.26 + 1.95$$

$$= 0$$



$$\hat{y}_i = -8.8 + 0.895(16) = 5.52$$

$$s^2 = \text{var}(\hat{u}_i) = \frac{\sum_{i=1}^{10} \hat{u}_i^2}{n-2} = \frac{14.047}{10-2} = 1.7614$$

$$\text{var}(\hat{\beta}_1) = \frac{s^2}{\sum x_i^2} = \frac{s^2}{\sum (x_i - \bar{x})^2} = \frac{3.1025}{440} = 0.00705$$

$$\text{var}(\hat{\beta}_0) = \frac{\sum x_i^2}{n \sum x_i^2} (s^2) = \frac{440(3.1025)}{10(440)} = 3.1025$$

FOC w.r.t. to β_1 and get

$$\frac{\partial (\sum_i (y_i - \beta_1 x_i - u_i)^2)}{\partial \beta_1} \rightarrow 0 = \sum_i 2(-x_i)(y_i - \beta_1 - u_i)$$