HW11 20224314 강현구.

12.6.6.

		Degree of freedom	Sum	Mean square	F-value
$\hat{y}-\bar{y}$	regression	1	7.299	7.299	1.1298
$y-\hat{y}$	error	10	64.602	6.4602	
$y-\bar{y}$	Total	11	71.90152		

p-value : 0.313

$$y = 0.2437x + 317.7537$$

$$\sum(y_i-\bar{y})^2 = \sum(y_i-\hat{y}_i)^2 + (\hat{y}_i-\bar{y})^2$$

$\Rightarrow$ It is hard to reject $H_0 : \beta_1 = 0$.

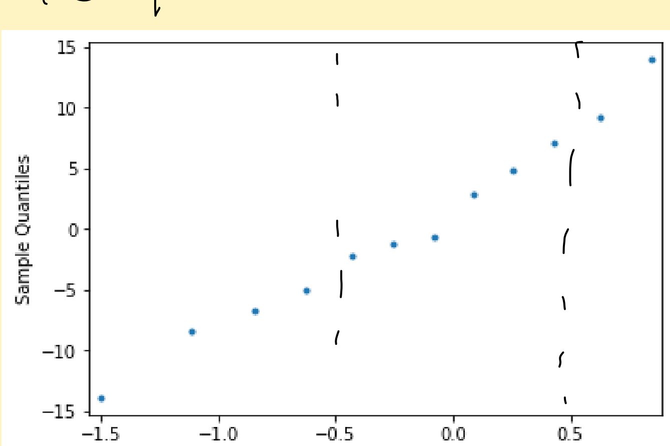
12.7.2.

We can check outlier by $\dfrac{e_i}{s.e.(e_i)} \sim N(0,1)$

Since $s.e.(e_i) = \sqrt{Var(e_i)} = \sqrt{\left(1-\frac{1}{n}-\frac{(x_i-\bar{x})^2}{S_{xx}}\right)}\cdot\sigma \approx \sigma$.

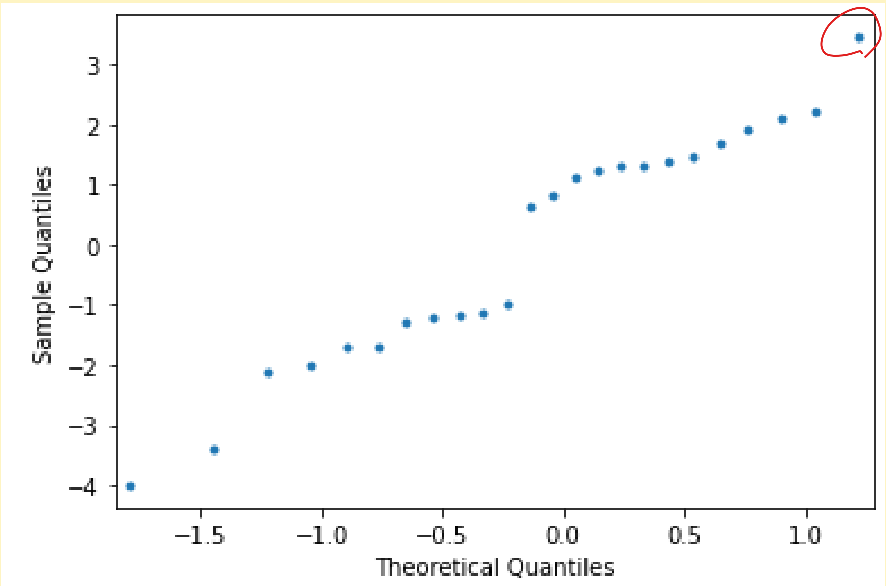
Since $\hat{\sigma}^2 = MSE$, $\hat{\sigma} \approx 8.3900$.

$\Rightarrow \left|\dfrac{e_i}{\hat{\sigma}}\right|$의 값이 가장 큰 경우가 1.6176 으로 outlier가 있다고 하기 어렵다.



normal probability plot을 고려했을 때 평균에 가까운 값들이 많아, normal 이라 고려할 수 있다

12.7.6.



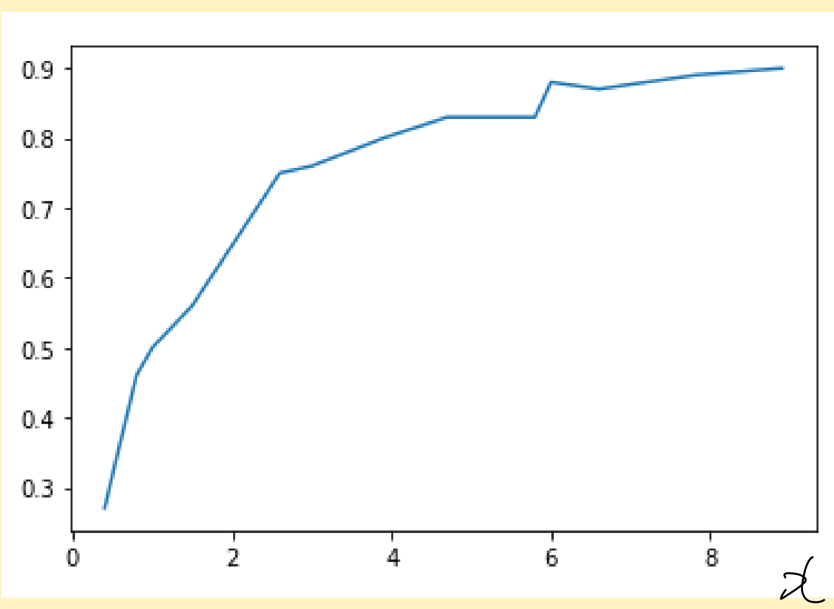
· There is possible outlier.

And qq plot is not similar strict line,

fitted regression model could be not appropriate.

12.8.2.

y



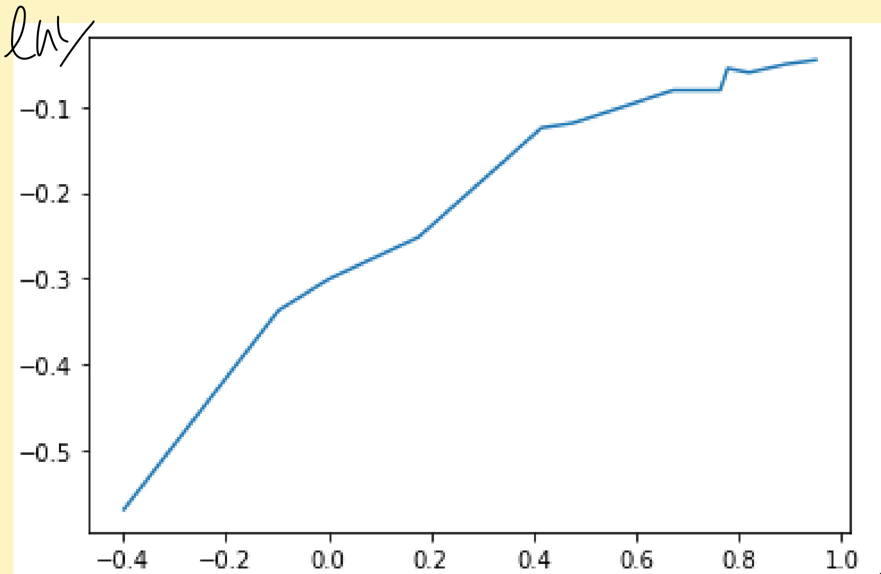
x

· This graph looks like log function.

So change it as

$\ln y = \gamma_0 + \ln x \cdot \gamma_1$.

lny



lnx.

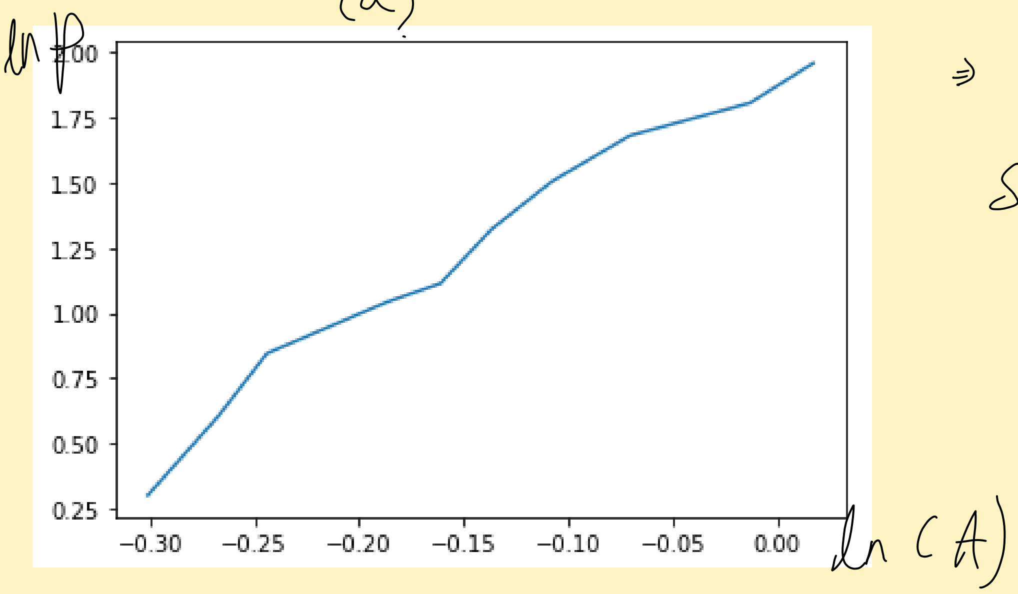
it looks similar as linear.

Then. $\widehat{\ln y} = 0.32652 \cdot \ln x - 0.31891$

when $x=2$. $\hat{y} \approx 0.911573$

12.84.

(a)



⇒ it looks like strict line.
So. this model appeal to provide a good fit to the dataset.

(b) $\ln y = \underbrace{4.4937}_{\gamma_1} \cdot \ln x + \underbrace{1.8824}_{\gamma_0}$.

(c) $\gamma_1 \sim N\left(\gamma_1, \frac{\hat{\sigma}}{\sqrt{S_{x'x'}}}\right)$ ※ 이때 $x' = \ln x$ 임

since, $\hat{\sigma}^2 = \frac{SSE}{n-2} \approx 0.0115$

$S_{x'x'} \approx 0.01131$

95% C.I. of $\gamma_1 = [4.4937 - \underbrace{2.306}_{t_{0.025,8}} \times 1.6083, \ 6.8189]$

$= [2.1684, \ 6.8189]$

since $\gamma_0 = \overline{\ln y} - \gamma_1 \overline{\ln x}$

95%. C.I. of $\gamma_0 = [1.8428, 1.9220]$

12.8.6.

$$e^{y/\gamma_0} = \gamma_1 / x^2.$$

log

$$y/\gamma_0 = \ln \gamma_1 - 2\ln x.$$

$$\Leftrightarrow \quad y = \underbrace{\gamma_0 \cdot \ln \gamma_1}_{\approx \beta_0} \underbrace{-2\gamma_0}_{\approx \beta_1} \cdot \ln x.$$

let $\ln x = t$, then $y = \gamma_0 \cdot \ln \gamma_1 - 2\gamma_0 \cdot t$. : linear form.

We already know how to find $\hat{\beta}_0, \hat{\beta}_1$;

And $\hat{\beta}_1 = -2\hat{\gamma}_0$, $\hat{\beta}_0 = \hat{\gamma}_0 \cdot \ln \hat{\gamma}_1$.

$$\Leftrightarrow \hat{\gamma}_0 = -\frac{1}{2} \cdot \hat{\beta}_1, \quad \hat{\gamma}_1 = e^{\left(\frac{\hat{\beta}_0}{\hat{\gamma}_0}\right)} = \exp(-2\hat{\beta}_0 / \hat{\beta}_1).$$

12.9.4.

$$r = \frac{S_{xy}}{\sqrt{S_{xx}} \cdot \sqrt{S_{yy}}} \approx 0.3186.$$

then $t = \dfrac{r \cdot \sqrt{n-2}}{\sqrt{1-r^2}} \approx 1.0628$.

$$\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}} \approx 0.2658, \quad s.e.(\hat{\beta}_1) = \frac{\hat{\sigma}}{\sqrt{S_{xx}}} \approx 0.2501.$$

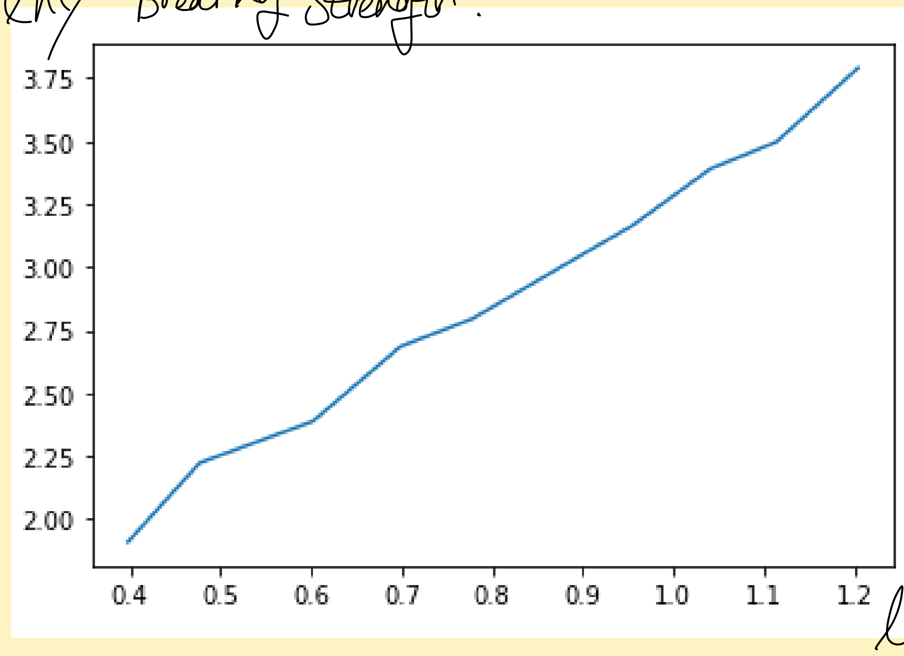
$$\because \begin{cases} \hat{\sigma}^2 = \dfrac{SSE}{n-2} \approx 6.4602. \\ S_{xx} = 103.2431 \end{cases}$$

$$\therefore t = \frac{r \cdot \sqrt{n-2}}{\sqrt{1-r^2}} \approx 1.0628, \quad \frac{\hat{\beta}_1}{s.e.(\hat{\beta}_1)} = 1.0627.$$

#12.12.19.

let. $\ln y = r_0 + r_1 \cdot \ln x$.

$\ln y$: Breaking strength.



$\ln x$: Diameter.

recommend.

$\ln y = 2.7696 + 0.1466 \cdot \ln x$.