

LS by NLP

Domany Data

X y

2 4

8 15

9 8

10 13

$$\left. \begin{array}{l} \text{Expected model} \\ \beta_0 + \beta_1 x_i = \hat{y} \end{array} \right\}$$

error format: $(\beta_1 x_i + \beta_0 - y)^2$

sum of errors: $\sum_{i=1}^4 (\beta_1 x_i + \beta_0 - y_i)^2$

" " " "

open form

$$\begin{aligned} &: (2\beta_1 + \beta_0 - 4)^2 + \\ &\quad (8\beta_1 + \beta_0 - 15)^2 + \\ &\quad (9\beta_1 + \beta_0 - 8)^2 + \\ &\quad (10\beta_1 + \beta_0 - 13)^2 \end{aligned}$$

↓

~~$$249\beta_1^2 + 58\beta_1\beta_0 - 660\beta_1$$~~

$$249\beta_1^2 + 58\beta_1\beta_0 - 660\beta_1 + 4(\beta_0)^2 - 80\beta_0 + 474$$

↓

GAMS de NLP \rightarrow solve

$$\left. \begin{array}{l} 1.032 = \beta_1 \\ 2.516 = \beta_0 \end{array} \right\}$$

OK

Suggestion

X+X+X+X

② step ahead example with the same data

WEIGHTS : $c(0.6, 0.4)$

Dummy Data

order		
1	2	4
2	8	15
3	9	8
4	10	13

Expected model

$$w_0 + w_1 \cdot x = \hat{y}$$

$$\text{error format : } 0.6(w_0 + w_1 \cdot x_i - y)^2 + 0.4(w_0 + w_1 \cdot x_{i+1} - y)^2$$

Open form :

$$\begin{aligned} &0.6(2w_1 + w_0 - 4)^2 + 0.4(8w_1 + w_0 - 15)^2 + \\ &0.6(8w_1 + w_0 - 15)^2 + 0.4(9w_1 + w_0 - 8)^2 + \\ &0.6(9w_1 + w_0 - 8)^2 + 0.4(10w_1 + w_0 - 13)^2 + \\ &-(10w_1 + w_0 - 13)^2 \end{aligned}$$

$$287.4w_1^2 + 64.4w_1 \cdot w_0 - 757.6w_1 + 4 \cdot w_0^2 + 535.2 - 87.2w_0$$

↓
GAMS ile NLP ~~code~~ *code*

$$w_1 = 1.023$$

$$w_0 = 2.663$$

For 3 step ahead is
in next page

Suggestion

(3) step ahead example with the
new data

Training Data

WEIGHTS: $c(0.5, 0.3, 0.2)$

x	y
2	4
8	15
9	8
10	13

} Expected model:
 $\alpha_0 + \alpha_1 \cdot x = \hat{y}$

error format $0.5(\alpha_0 + \alpha_1 x_i - y_i)^2 + 0.3(\alpha_0 + \alpha_1 x_{i+1} - y_{i+1})^2 + 0.2(\alpha_0 + \alpha_1 x_{i+2} - y_{i+2})^2$

open form:

$$\begin{aligned} &0.5(\alpha_0 + \alpha_1 \cdot 2 - 4)^2 + 0.3(\alpha_0 + 8\alpha_1 - 15)^2 + 0.2(\alpha_0 + 9\alpha_1 - 8)^2 + \\ &0.5(\alpha_0 + 8\alpha_1 - 15)^2 + 0.3(\alpha_0 + 9\alpha_1 - 8)^2 + 0.2(\alpha_0 + 10\alpha_1 - 13)^2 + \\ &0.5(\alpha_0 + 9\alpha_1 - 8)^2 + 0.5(\alpha_0 + 10\alpha_1 - 13)^2 + \\ &(\alpha_0 + 10\alpha_1 - 13)^2 \end{aligned}$$

$$272.2\alpha_1^2 + 58.8\alpha_1\alpha_0 - 662\alpha_1 + 3.5\alpha_0^2 - 419.3 - 72.7\alpha_0$$

↓
Solved using NLP

$$\begin{aligned} \alpha_1 &= 1.017 \\ \alpha_0 &= 1.846 \end{aligned}$$