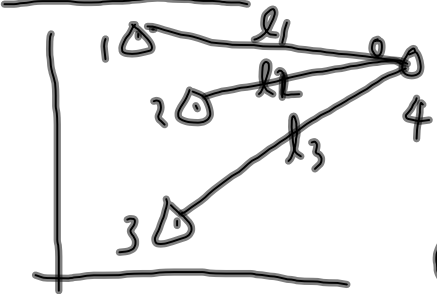


Unified LS



$X_4 = 801 \quad \sigma_x = 0.05 \quad \checkmark \quad 37-1$   
 $Y_4 = 1000 \quad \sigma_y = 0.05 \quad \checkmark$   
 $\sigma = 0.2$   
 $\sigma_0 = 0.2, \sigma_0^2 = 0.04 \quad \checkmark$

$$W_{xx} = \begin{bmatrix} \frac{\sigma_0^2}{\sigma_x^2} & 0 \\ 0 & \frac{\sigma_0^2}{\sigma_y^2} \end{bmatrix} = \begin{bmatrix} 16 & 0 \\ 0 & 16 \end{bmatrix} \checkmark$$

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37-2

$f_x = (x^0 - x)$   
 current value of parameter estimate  $\uparrow$   $x^0$   
 original value  $\leftarrow$  corresponds to  $W_{xx}, \sigma_x, \sigma_y$

NE:  $[N + W_{xx}] \Delta = (t - W_{xx} \cdot f_x)$

$$\Delta = [N + W_{xx}]^{-1} (t - W_{xx} \cdot f_x)$$

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$$\delta: \begin{array}{l} 10^{-1} \\ 10^{-6} \\ 10^{-12} \\ \vdots \end{array}$$

801.122, 1000.026

37-3

801

1000

$$V = \begin{bmatrix} -0.720 \\ -1.061 \\ -0.342 \end{bmatrix}$$

look in notes, Matlab code for these examples.

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Conditions both examples: constraint & prior<sup>37-4</sup>

values for unified both little

inconsistent with model  $\Rightarrow$

residuals were much larger

weight: very large  $\Rightarrow$

acts like constant

: very small

acts like completely unknown

very powerful technique  $\Rightarrow$  prudent, careful, ...

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Sequential LS

$$l_1 + v_1 = m x_1 + b$$

$$v_1 - m x_1 - b = -l_1$$

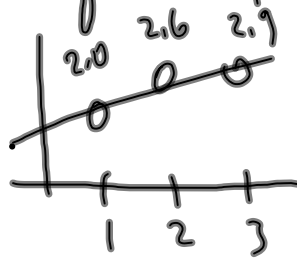
$$v_1 + [-x_1 \ -1] \begin{bmatrix} m \\ b \end{bmatrix} = -l_1$$

$$\begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} + \begin{bmatrix} -1 & -1 \\ -2 & -1 \\ -3 & -1 \end{bmatrix} \begin{bmatrix} m \\ b \end{bmatrix} = \begin{bmatrix} -2.0 \\ -2.6 \\ -2.9 \end{bmatrix}$$

$$V + B \Delta = f$$

$$N = B^T B \quad \checkmark$$

$$t = B^T f \quad \checkmark$$

Sequential formulas of ~~37-5~~ 37-5

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$$N = B^T B : \begin{bmatrix} \begin{bmatrix} -1 \\ -1 \end{bmatrix} & \begin{bmatrix} -2 \\ -1 \end{bmatrix} & \begin{bmatrix} -3 \\ -1 \end{bmatrix} & \begin{bmatrix} -1 & -1 \\ -2 & -1 \\ -3 & -1 \end{bmatrix} \end{bmatrix} = B \quad 37-6$$

$$\begin{bmatrix} \underline{1+4+9} & \underline{1+2+3} \\ \underline{1+2+3} & \underline{1+1+1} \end{bmatrix} = \begin{bmatrix} 14 & 6 \\ 6 & 3 \end{bmatrix} = N$$

$$t = B^T f$$

$$\begin{bmatrix} \begin{bmatrix} -1 \\ -1 \end{bmatrix} & \begin{bmatrix} -2 \\ -1 \end{bmatrix} & \begin{bmatrix} -3 \\ -1 \end{bmatrix} & \begin{bmatrix} -2.0 \\ -2.6 \\ -2.9 \end{bmatrix} \end{bmatrix} = \begin{bmatrix} t_1 & t_2 & t_3 \\ \underline{1 \cdot 2 + 2 \cdot 2.6 + 3 \cdot 2.9} \\ \underline{2.0 + 2.6 + 2.9} \end{bmatrix} = \begin{bmatrix} 15.9 \\ 7.5 \end{bmatrix}$$

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$$\begin{pmatrix} \underline{1} + \underline{4} + \underline{9} & \underline{1} + \underline{2} + \underline{3} \\ \underline{1} + \underline{2} + \underline{3} & \underline{1} + \underline{1} + \underline{1} \end{pmatrix} = N \quad 37-7$$

$$\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} + \begin{bmatrix} 4 & 2 \\ 2 & 1 \end{bmatrix} + \begin{bmatrix} 9 & 3 \\ 3 & 1 \end{bmatrix} = N$$

$$N_1 + N_2 + N_3$$

Come only  
from 1st  
cond. eqn.

Come only  
from 2nd  
cond. eqn.

...

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$$t = t_1 + t_2 + t_3$$

37-8

$$\begin{bmatrix} 2 \\ 2 \end{bmatrix} + \begin{pmatrix} 5.2 \\ 2.6 \end{pmatrix} + \begin{pmatrix} 8.7 \\ 2.9 \end{pmatrix} = \begin{pmatrix} 15.9 \\ 7.5 \end{pmatrix}$$

$$N_1 = b_1^T b_1 = \begin{bmatrix} -1 \\ -1 \end{bmatrix} \begin{pmatrix} -1 & -1 \end{pmatrix} = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$

$$N_2 = b_2^T b_2 = \begin{bmatrix} -2 \\ -1 \end{bmatrix} \begin{pmatrix} -2 & -1 \end{pmatrix} = \begin{bmatrix} 4 & 2 \\ 2 & 1 \end{bmatrix}$$

$$N_3 = b_3^T b_3 = \begin{bmatrix} -3 \\ -1 \end{bmatrix} \begin{pmatrix} -3 & -1 \end{pmatrix} = \begin{bmatrix} 9 & 3 \\ 3 & 1 \end{bmatrix}$$

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