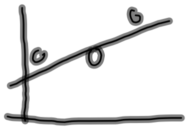
38-1



$$\begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} + \begin{pmatrix} -1 & -1 \\ -2 & -1 \\ -3 & -1 \end{pmatrix} \begin{pmatrix} m \\ b \end{pmatrix} = \begin{pmatrix} -2.0 \\ -2.6 \\ -2.9 \end{pmatrix} \qquad W = I_3$$

$$v + B\,o = f$$

$$v_1 + \begin{pmatrix} -1 & -1 \end{pmatrix} \begin{pmatrix} m \\ b \end{pmatrix} = (-2.0) \qquad v_1 + b_1 o = f_1$$

$$v_2 + \begin{pmatrix} -2 & -1 \end{pmatrix} \begin{pmatrix} m \\ b \end{pmatrix} = (-2.6) \qquad v_2 + b_2 o = f_2$$

$$v_3 + \begin{pmatrix} -3 & -1 \end{pmatrix} \begin{pmatrix} m \\ b \end{pmatrix} = (-2.9) \qquad v_3 + b_3 o = f_3$$

$N_1 = b_1^T b_1$ $\quad N_2 = b_2^T b_2$ $\quad N_3 = b_3^T b_3$ $\quad N = N_1 + N_2 + N_3$

$t_1 = b_1^T f_1$ $\quad t_2 = b_2^T f_2$ $\quad t_3 = b_3^T f_3$

Nov 21-9:21 AM

38-2

$$t_1 = \begin{pmatrix} 2 \\ 2 \end{pmatrix}, \quad t_2 = \begin{pmatrix} 5.2 \\ 2.6 \end{pmatrix}, \quad t_3 = \begin{pmatrix} 8.7 \\ 2.9 \end{pmatrix}$$

$$\left(\sum_{i=1}^{n} N_i \right) o = \left(\sum_{i=1}^{n} t_i \right)$$

$$\left(\sum_{i=1}^{n} b_i^T b_i \right) o = \sum_{i=1}^{n} \left(b_i^T f_i \right)$$

suppose 1000 obs. $\quad N = N_1 + N_2 + \dots + N_{1000}$

$t = t_1 + t_2 + \dots + t_{1000}$

$[B]$ 1000x2 $\longleftrightarrow$ $[\;]$ N 2x2

Nov 21-9:21 AM

38-3

Mobile Device processor with large external storage (SSD)

limited RAM

data on slow external device

NE on processor with small memory

Technique also works for Deletion, Subtraction

obs # 526 is incorrect

$N' = N - N_{256}$

$t' = t - t_{256}$

$\delta' = (N')^{-1} t'$

Nov 21-9:21 AM

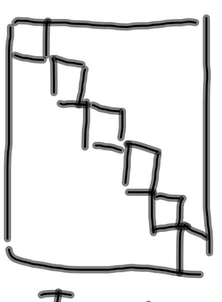
38-4

assumptions : $W = I$

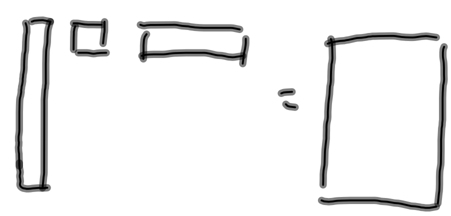
$W =$ diagonal ✓

$W =$ block diagonal ✓

WILL NOT WORK for W full

$W =$ 

$b_i^T \quad w_i \quad b_i$



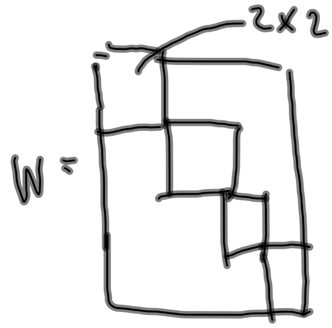
$N_i = b_i^T w_i b_i$

$t_i = b_i^T w_i f_i$

Summands each equation

Nov 21-9:21 AM

38-5

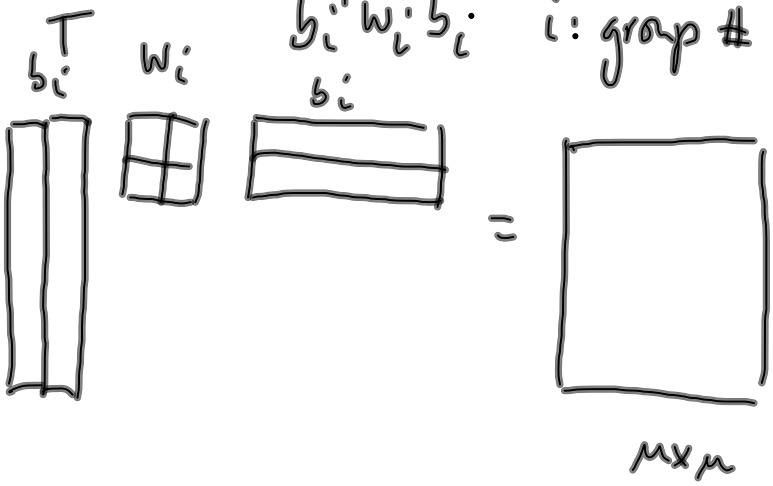
$W =$ 

block diagonal : form N_i

i^{th} equation group, form N_i

2 equations at a time

$b_i^T W_i b_i$ $\quad i$: group #



Nov 21-9:21 AM

38-6

up to now Indirect Obs. model

$$Av + B\Delta = f \quad \text{Gen. LS}$$

$$Q_e = AQA^T \quad \text{diagonal or block diagonal}$$

$$\underline{W_e} = Q_e^{-1} \quad \text{" " "}$$

$$N_i = b_i^T W_{e_i} b_i \quad i: \text{point number}$$

$$t_i = b_i^T W_{e_i} f_i$$

LINEAR : solution same identical

NONLINEAR : slightly different

Nov 21-9:21 AM

$N_i = N_{i-1} + B_i^T w_i B_i$, N_i: N up to i^{th} contribution　　38-7

$t_i = t_{i-1} + B_i^T w_i f_i$　　t_i: "

Sherman Morrison Woodbury Schur
Matrix Inversion Lemma

$$\boxed{(Y \pm UZV)^{-1} = Y^{-1} \mp Y^{-1}U\left(Z^{-1} \pm VY^{-1}U\right)^{-1} V Y^{-1}}$$ ✓

$$\begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix} \begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix} = \begin{bmatrix} I_m & 0 \\ 0 & I_n \end{bmatrix}$$

Solve for B_{ij} in terms of A_{ij}

Nov 21-9:21 AM

$N_i = (\underline{N_{i-1} + B_i^T w_i B_i})$　　38-8

$$N_i^{-1} = N_{i-1}^{-1} - N_{i-1}^{-1} B_i^T \underline{\left(Q_i + B_i N_{i-1}^{-1} B_i^T\right)^{-1}} B_i N_{i-1}^{-1}$$

$t_i = \underline{t_{i-1} + B_i^T w_i f_i}$

$\Delta_i = N_i^{-1} t_i$

$$\Delta_i = \left[N_{i-1}^{-1} - N_{i-1}^{-1} B_i^T \left(Q_i + B_i N_{i-1}^{-1} B_i^T\right)^{-1} B_i N_{i-1}^{-1}\right] \cdot \left(t_{i-1} + B_i^T w_i f_i\right)$$

Nov 21-9:21 AM

multiply prior expression 38-9

$$\Delta_i = N_{i-1}^{-1} \cdot t_{i-1}$$

$$+ N_{i-1}^{-1} B_i^T w_i f_i$$

$$- N_{i-1}^{-1} B_i^T \Big(Q_i + \overset{J}{\overset{\shortparallel}{\boxed{B_i N_{i-1}^{-1} B_i^T}}}\Big)^{-1} B_i N_{i-1}^{-1} t_{i-1}$$

$$-N_{i-1}^{-1} B_i^T \left(Q_i + J\right)^{-1} J\, w_i f_i$$

$$(A+B)^{-1} = A^{-1}(A^{-1}+B^{-1})^{-1} B^{-1} \quad A, B \text{ inverses exist}$$

$$- N_{i-1}^{-1} B_i^T w_i \underbrace{(w_i + J^{-1})^{-1}}_{\text{Apply matrix inversion form.}} \underbrace{J^{-1} J}\, w_i f_i$$

$(U, V = I)$

Nov 21-9:21 AM

$$-N_{i-1}^{-1} B_i^T w_i \left[Q_i - Q_i (J + Q_i)^{-1} Q_i\right] w_i f_i \qquad 38\text{-}10$$

$$- N_{i-1}^{-1} B_i^T w_i f_i + N_{i-1}^{-1} B_i^T (J+Q)^{-1} f_i$$

Nov 21-9:21 AM