

Pengembangan Program SAS/IML (3)

$\tau\rho$

Operator SWEEP

- Algoritma:
 - $D = a_{kk}$
 - Bagi baris ke-k dengan D
 - Untuk setiap baris ke $i \neq k$, lakukan:
 1. $B = a_{ik}$
 2. Kurangkan baris ke-i dengan B kali baris ke-k
 3. $a_{ik} = -B/D$
 - $a_{kk} = 1/D$

Contoh 1

```
proc iml;  
reset print;  
A1 = {6 0 0, 0 28 -12, 0 -12 6};  
B = sweep(A1, {1});  
C = sweep(A1, {2});  
  
D = sweep(B, {2});  
E = sweep(A1, {1 2});  
F = sweep(A1, {2 1});  
  
G = sweep(E, {1 2});  
H = sweep(E, {1});
```

SWEEP Operator

$$X'X = \begin{pmatrix} 6 & 0 & 0 \\ 0 & 28 & -12 \\ 0 & -12 & 6 \end{pmatrix} \quad X'y = \begin{pmatrix} 14 \\ 6 \\ -4 \end{pmatrix} \quad y'y = 42$$

$$A = \begin{pmatrix} X'X & X'y \\ y'X & y'y \end{pmatrix}$$

$$\hat{\beta} = (X'X)^{-1}X'y$$

$$SSE = Y'Y - Y'(X(X'X)^{-1}X')Y$$

Catatan SWEEP

- SWEEP untuk regresi, misalkan **A**

$$\begin{bmatrix} X'X & X'Y \\ Y'X & Y'Y \end{bmatrix}$$

- dengan **X'X** berukuran $k \times k$.

Maka **B** = SWEEP(**A**, 1 ... k) berisi

$$\begin{bmatrix} (X'X)^{-1} & (X'X)^{-1}X'Y \\ -Y'X(X'X)^{-1} & Y'(I - X(X'X)^{-1}X')Y \end{bmatrix}$$

- Partisi dari **B** ialah nilai dugaan beta, SSE, and matriks covariance dari dugaan beta

Contoh 2

```
proc iml;  
  reset print;  
  XX = {6 0 0, 0 28 -12, 0 -12 6};  
  XY = {14, 6, -4};  
  YY = 42;  
  
  A = (XX || XY) // (XY` || YY);  
  HASIL = sweep(A, {1 2 3});  
  
  beta = HASIL[1:3, 4];  
  JKG = HASIL[4, 4];  
  KTG = JKG / (6-3);
```

Application DO LOOP

- Numerical Methods for finding solution from equation $f(x) = 0$

→ Newton Raphson

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

Contoh 3

- Let the equation $x^3 - x - 1 = 0$

Using Newton Raphson method, find the real root from the equation above !

Jawaban 3

- $f(x) = x^3 - x - 1$
- $f'(x) = 3x^2 - 1$
- Since $f(1) = -1$ and $f(2) = 5$, the function has a root in the interval $[1,2]$
- Let's make an initial guess $x_0 = 1.5$

$$x_{n+1} = x_n - \frac{x_n^3 - x_n - 1}{3x_n^2 - 1}$$

Jawaban 3

```
proc iml;  
e = 10;  
f0 = 0;  
x0 = 1.5;  
do while (e > 10**(-5)) ;  
    x1 = x0 - ((x0**3 - x0 - 1) / (3*x0**2 - 1)) ;  
    f1 = x1**3 - x1 - 1;  
    e = abs(f1 - f0) ;  
    x0 = x1;  
end;  
print x1 f1;
```

ATAU

Jawaban 3

```
proc iml;  
x0 = 7;  
i = 0;  
e = 1;  
do while (e > 10**-5) ;  
    i = i + 1;  
    x1 = x0 - (x0**3 - x0 - 1) / (3*x0**2 - 1) ;  
    e = abs(x1 - x0) ;  
    x0 = x1 ;  
end ;  
print i x0 ;
```

Terima kasih 😊