REVISED DUAL SIMPLEX METHOD

TO SOLVE

$$\text{Max } c^T x \quad \text{s.t. } Ax = b,\ x \geq 0 \quad \text{(PRIMAL)}$$

$$\text{MIN } b^T y \quad \text{(DUAL)} \quad \text{s.t. } A^T y + s = C,\ s \leq 0$$

$s \to$ NEGATIVE OF THE DUAL SLACKS

STEP 0 :— CHOOSE B AND N such that

$$S_N = (C_N - A_N^T y) \leq 0$$

where y is obtained from

$$A_B^T y = c_B$$

STEP 1 :— Let $x_B = A_B^{-1} b$ (i.e $A_B x_B = b$)

If $x_B \geq 0$, we are OPTIMAL, STOP!

ELSE, let

$$k = \underset{i=1,2,\cdots,m}{\text{ARG MIN}} \{ x_{B(i)} \}$$

$X_{B(k)}$ is the LEAVING BASIC VARIABLE

STEP 2 :— SOLVE

$A_B^T v = e_k$ WHERE e_k is the m DIMENSIONAL VECTOR WITH 1 in the kth position and 0s ELSEWHERE

STEP 3 :— LET $w = A_N^T v$

STEP 3 :— (CONTINUED) If $w \geq 0$, OUR PRIMAL LP IS INFEASIBLE, STOP !

(2)

ELSE LET

$$t = \min_{\substack{i=1,2,\dots,n \\ w_i < 0}} \left\{ \frac{s_{N(i)}}{w_i} \right\}$$

AND

$$l = \operatorname*{arg\,min}_{\substack{i=1,2,\dots,n \\ w_i < 0}} \left\{ \frac{s_{N(i)}}{w_i} \right\}$$

$x_{N(l)}$ IS THE ENTERING NONBASIC VARIABLE

STEP 4 :— SOLVE

$$A_B d = a_{N(l)}$$

($a_{N(l)}$ is the "$N(l)$"th COLUMN OF A)

STEP 5 :— Let

$$\theta = \frac{x_{B(k)}}{w_l}$$

SET

$$x_{B(i)} = x_{B(i)} - \theta d_i, \quad i = 1,2,\dots,m, \ i \neq k$$

$$x_{B(k)} = \theta$$

$$B = (B \cup \{N(l)\}) / \{B(k)\}$$

SET

$$s_{N(j)} = s_{N(j)} - t w_j, \quad j = 1,2,\dots,n, \ j \neq l$$

$$s_{N(l)} = -t$$

RETURN TO STEP (1)