Bab. VI : Lampiran

Untuk mencari Rumus Slow moving, Semi Fast moving dan Fast moving. didalam "Inventory Central" dengan metoda multiplikasi Lagrange adalah sebagai berikut.

I. Slow moving

St = 2 x (banyak kurang pra pesanan) - (kebutuhan pra bulan).

$St = 2X_i - \frac{Zi}{12}$

$n = \frac{12}{N}$ dimana $N = \frac{Zi}{Xi}$

$n = \frac{12\,Xi}{Zi}$

$$T.C = C_r \sum \frac{Zi}{Xi} + Ct \sum \frac{XiCi}{2} + Cs \sum \left[Xi + St - (n-1)(\text{kebutuhan pra bulan})\right] Ci$$

$$T.C = 750 \sum \frac{Zi}{Xi} + 0{,}12 \sum \frac{XiCi}{2} + 0{,}10 \sum \left[Xi + (2Xi - \frac{Zi}{12}) - (\frac{12Xi}{Zi} - 1)(\frac{Zi}{12})\right] Ci$$

$$T.C = 750 \sum \frac{Zi}{Xi} + 0{,}26 \sum XiCi.$$

Pembatas

a). Alokasi dana $\leqslant \sum \frac{ZiCi}{4}$

$g1 = Xi\,Ci - 0{,}25\,Zi\,Ci. = 0$

b). Kapasitas penyimpanan barang didalam gudang TAK ADA.

$g2 = 0$

c). Jumlah bunga maximal yang harus dikembalikan $\leqslant 20\% \sum \frac{Zi\,Ci}{4}$

$$g3 = \sum \left[Xi + St - (n-1)(\text{kebutuhan pra bulan})(1+t)^{n-1}\right] - 20\% \sum \frac{Zi\,Ji}{4} = 0$$

$$\sum \left[Xi + 2Xi - \frac{Zi}{12} - (\frac{12Xi}{Zi} - 1)(\frac{Zi}{12}) \left\{(1{,}015)^3 + (1{,}015)^2 + (1{,}012) + 1\right\}\right.$$

$$- 0{,}05 \sum ZiCi.$$

$$-1{,}0909 \sum Xi + 0{,}2578 \sum Zi - 0{,}05 \sum ZiCi.$$

Persamaan Lagrange

$$f = T.C + \lambda(g1 + g2 + g3)$$

$$= 750 \sum \frac{Zi}{Xi} + 0,26 \sum XiCi + \lambda\left[\sum XiCi - 0,25 \sum Zi\,Ci \right.$$

$$\left. -1,0909 \sum Xi + 0,25758 \sum Zi - 0,05 \sum Zi\,Ci \right.$$

$$\frac{\partial f}{\partial Xi} = -\frac{750\,Zi}{Xi^2} + 0,26Ci + \lambda(Ci - 1,0909)$$

$$\frac{\partial f}{\partial \lambda} = \sum XiCi - 0,3 \sum ZiCi - 1,0909 \sum Xi + 0,25758 \sum Zi$$

$$: \frac{\partial f}{\partial Xi} = 0$$

$$\frac{\partial f}{\partial \lambda} = 0$$

maka $$-\frac{750\,Zi}{Xi^2} + 0,26\,Ci + \lambda\,(Ci - 1,0909) = 0.$$

$$Xi^2 = \frac{750\,Zi}{0,26\,Ci + \lambda\,(Ci - 1,0909)}$$

$$Xi = \sqrt{\frac{750\,Zi}{0,26\,Ci + \lambda(Ci - 1,0909)}}$$

$$\sum Xi\,(Ci - 1,0909) = 0,3 \sum Zi\,Ci - 0,25758 \sum Zi$$

$$\frac{750\,Zi\,(Ci - 1,0909)^2}{0,26\,Ci + \lambda(Ci - 1,0909)} = (0,3 \sum Zi\,Ci - 0,25758 \sum Zi)^2$$

$$\lambda = \frac{750\,(Ci - 1,0909)}{(0,3 \sum Ci - 0,25758)^2} - \frac{0,26\,Ci}{(Ci - 1,0909)}$$

Contoh penyelesaian :

1). Untuk $Z_{20} = 1$ dan $C_{20} = 96000$.

$$\lambda = \frac{750\,(Ci - 1{,}0909)}{(0{,}3\,Ci - 0{,}25758)^2} - \frac{0{,}26\,Ci}{(Ci - 1{,}0909)}$$

$$= \frac{750\,(96000 - 1{,}0909)}{(0{,}3 \times 96000 - 0{,}25758)^2} - \frac{0{,}26 \times 96000}{(96000 - 1{,}0909)}$$

$$= 0{,}086806121 - 0{,}260002954$$

$$= -0{,}173196833.$$

$$X_i = \sqrt{\frac{750\,Zi}{0{,}26\,Ci + (Ci - 1{,}0909)}}$$

$$= \sqrt{\frac{750\,Zi}{0{,}26 \times 96000 - 0{,}1732\,(96000 - 1{,}0909)}}$$

$$= 0{,}300006.$$

2). Untuk $Z_{99} = 3$ dan $C_{99} = 250$.

$$\lambda = \frac{750\,(250 - 1{,}0909)}{(0{,}3 \times 250 - 0{,}25758)^2} - \frac{0{,}26 \times 250}{(250 - 1{,}0909)}$$

$$= 33{,}1558959$$

$$X_i = \sqrt{\frac{750 \times 3}{0{,}26 \times 250 + 33{,}1559\,(250 - 1{,}0909)}} = 0{,}5201.$$

II. Semi Fast moving dan Fast moving.

S_t = 2 x (banyak barang pra pesanan) - (lead time) (kebutuhan pra bulan)

$$S_t = 2 X_i - \frac{Z_i}{24}$$

$$n = \frac{12Xi}{Z_i}$$

$$T.C = C_r \sum \frac{Z_i}{Xi} + Ct \sum \frac{XiCi}{2} + C_s \sum \left[Xi + S_t - (n-1)(\text{kebutuhan pra bulan}) \right] C_i$$

$$+ C_r \sum \left[X_i + S_t - (n-1)(\text{kebutuhan pra bulan}) \right] Ci$$

$$= 750 \sum \frac{Z_i}{Xi} + 0{,}12 \sum \frac{XiCi}{2} + 0{,}10 \sum \left[X_i + 2Xi - \frac{Z_i}{24} - \left(\frac{12Xi}{Z_i} - 1 \right)\left(\frac{Z_i}{12} \right) \right] C_i$$

$$+ 0{,}15 \sum \left[Xi + 2Xi - \frac{Z_i}{24} - \left(\frac{12Xi}{Z_i} - 1 \right)\left(\frac{Z_i}{12} \right) \right] C_i$$

$$T.C = 750 \sum \frac{Z_i}{Xi} + 0{,}56 \sum X_i C_i + 0{,}0104 \sum Z_i Ci.$$

Pembatas

a). Alokasi dana $\leqslant \sum \frac{Z_i Ci}{4}$

$$g_i \equiv \sum XiCi - \sum \frac{Z_i Ci}{4} = 0$$

b). Kapasitas penyimpanan barang didalam gudang $\leqslant$ 10.000 unit.

$g_2 \equiv \sum$ 2 x [jumlah pesanan pra order - lead time (kebutuhan pra bulan)] - 10.000. = 0

$$\sum 2 \left[X_i - \tfrac{1}{2} \left(\frac{Z_i}{12} \right) \right] - 10.000.$$

$$2 \sum X_i - 0{,}08333 \sum Z_i - 10.000.$$

c). Jumlah bunga maximal yang harus dikembalikan 20% $\leqslant \sum \frac{Z_i Ci}{4}$

$$g_3 \equiv \sum \left[X_i + S_t - (n-1)(\text{kebutuhan pra bulan})(1+t)^{n-1} \right] - 0{,}05 \sum Z_i Ci. = 0$$

$$0{,}2991 \sum Z_i - 1{,}0909 \sum Xi - 0{,}05 \sum Z_i Ci.$$

Contoh penyelesaian

1). Untuk Semi Fast Moving

$Z_2 = 45$ dan $C_2 = 574$

$$\lambda = \frac{750\, Z_i\, (C_i + 0{,}9091)}{(0{,}3\, Z_i\, C_i - 0{,}2158 \cdot Z_i + 10000)^2} - \frac{0{,}56 \cdot C_i}{(C_i + 0{,}9091)}$$

$$= \frac{750 \times 45\, (574 + 0{,}9091)}{(0{,}3 \times 45 \times 574 - 0{,}2158 \times 45 + 10000)^2} - \frac{0{,}56 \times 574}{(574 + 0{,}9091)}$$

$$= 0{,}0616596 - 0{,}55911$$

$$= -0{,}497455.$$

$$X_i = \sqrt{\frac{750\, Z_i}{0{,}56\, C_i + \lambda\, (C_i + 0{,}9091)}}$$

$$X_i = \sqrt{\frac{750 \times 45}{0{,}56 \times 574 - 0{,}497455\, (574 + 0{,}9091)}}$$

$$= 30{,}8558\ //$$

2) Untuk Fast Moving

$Z_{20} = 884 \qquad C_{20} = 8995$

$$\lambda = \frac{750 \times 884\, (8995 + 0{,}9091)}{(0{,}3 \times 884 \times 8995 - 0{,}2158 \times 884 + 10000)^2} - \frac{0{,}56 \times 8995}{(8995 + 0{,}9091)}$$

$$\lambda = -0{,}5589039$$

$$X_i = \sqrt{\frac{750 \times 884}{0{,}56 \times 8995 - 0{,}5589039\, (8995 + 0{,}9091)}}$$

$$X_i = 266{,}2634.$$

Persamaan Lagrange

$$\mathcal{L} = T.C + \lambda (g_1 + g_2 + g_3)$$

$$= 750 \sum \frac{z_i}{x_i} + 0{,}56 \sum x_i . C_i + 0{,}0104 \sum z_i C_i + \lambda \left[\sum x_i C_i \right.$$

$$- 0{,}25 \sum z_i . C_i) + (2 \sum x_1 - 0{,}08333 \sum z_i - 10.000) +$$

$$\left. (0{,}2991 \sum z_i - 1{,}0909 \sum X_1 - 0{,}05 \sum z_i C_i) \right] .$$

$$\frac{\delta \mathcal{L}}{\delta X_i} = - \frac{750 z_i}{X_i^2} + 0{,}56 C_i + \lambda (C_i + 0{,}9091)$$

$$\frac{\delta \mathcal{L}}{\delta \lambda} = \sum X_i C_i - 0{,}3 \sum z_i C_i + 0{,}9091 \sum X_i + 0{,}2158 \sum z_i - 10.000$$

Syarat : $\frac{\delta \mathcal{L}}{\delta X_1} = 0$ dan

$$\frac{\delta \mathcal{L}}{\delta \lambda} = 0$$

maka : $$- \frac{750 z_i}{X_i^2} + 0{,}56 C_i + \lambda (C_i + 0{,}9091) = 0$$

$$X_i^2 = \frac{750 z_i}{0{,}56 C_i + \lambda (C_i + 0{,}9091)}$$

$$X_i = \sqrt{\frac{750 z_i}{0{,}56 C_i + \lambda (C_i + 0{,}9091)}}$$

dan $$\sum X_i . C_i - 0{,}3 \sum z_i C_i + 0{,}9091 \sum X_i + 0{,}2158 \sum z_i - 10.000 = 0$$

$$\sum X_i (C_i + 0{,}9091) = 0{,}3 \sum z_i C_i - 0{,}2158 \sum z_i + 10.000$$

$$\frac{750 z_i (C_i + 0{,}9091)^2}{0{,}56 C_i + \lambda (C_i + 0{,}9091)} = (0{,}3 \sum z_i C_i - 0{,}2158 \sum z_i + 10000)^2$$

$$\lambda = \frac{750 z_i (C_i + 0{,}9091)}{(0{,}3 \sum z_i C_i - 0{,}2158 \sum z_i + 10000)^2} - \frac{0{,}56 C_i}{(C_i + 0{,}9091)}$$