MS-E2191 Graduate Seminar on Operations Research

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Model solution for homework 6

1

The set of feasible weights S_w when Customer 1 is more important than Customer 2 and Customer 2 is more important than Customer 3, when the weights w_1, w_2 and w_3 correspond to customers 1, 2, and 3 respectively is:

$$S_w = \left\{ w \in \mathbf{R}^3 \middle| w \geq 0, w_1 > w_2, w_2 > w_3, \sum_{i=1}^{3} w_i = 1 \right\} \tag{1}$$

2

The score matrices are adjusted to include a dummy project, which captures the synergy that Customer 3 feels might occur if both Features 2 and 3 are implemented. Since, the synergy is uncertain its lower bound value is 0 and as told by Customer 3, its upperbound value is 30. This is reflected in the score matrices as follows.

$$\underline{v}_{new} = \begin{bmatrix} 20 & 30 & 50 \\ 25 & 25 & 20 \\ 10 & 9 & 8 \\ 0 & 0 & 0 \end{bmatrix}, \quad \bar{v}_{new} = \begin{bmatrix} 25 & 38 & 56 \\ 30 & 29 & 24 \\ 0 & 0 & 30 \end{bmatrix} \tag{2}$$

3

Adding a new dummy project does not affect the set of feasible weights because we have no additional preference information.

$$S_w^{new} = S_w \tag{3}$$

4

The core projects at budget level $R = 450$ in the illustrative example in the paper by Liesiö et al. (2008) are Features A7, A8, A9, B9, B11, B13, C11, C15 and Synergy 1.

The borderline projects at this budget level are Features A3, A4, B1, B6, B7, B8, C6, C8, C17.

The exterior projects are Features A1, A2, A5, A6, B2, B3, B4, B5, B10, B12, B14, C1, C2, C3, C4, C5, C7, C9, C10, C12, C13, C14, C16 and Synergies 2 and 3.