

Benevolent And Malevolent

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Two-Phase Approach

Phase 1

Same as DEA model choose from CRS or VRS and input or output orientation.

Phase 2

Get the efficiency score from Phase 1 for DMUs.

Malevolent - ALL - Input oriented model

$$\begin{aligned} & \text{minimize} \quad \sum_{r=1}^s v_{r,p} \sum_{j=1}^n y_{r,j} + \mu \\ & \text{subject to} \quad \sum_{i=1}^m v_{i,p} \sum_{j=1}^n x_{i,j} = 1 \\ & \quad \sum_{r=1}^s u_{r,p} y_{r,j} - \sum_{i=1}^m v_{i,p} x_{i,j} + \mu \leq 0 \quad \forall j \neq p \\ & \quad \sum_{r=1}^s u_{r,p} y_{r,p} - \theta_{p,p} \sum_{i=1}^m v_{i,p} x_{i,p} + \mu = 0 \\ & \quad v_{i,p}, u_{r,p} \geq 0 \\ & \quad \text{If } CRS \quad \text{where } \mu = 0 \\ & \quad \text{If } VRS \quad \text{where } \mu \text{ is free} \end{aligned}$$

Benevolent - ALL - Input oriented model

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Malevolent - Other - Input oriented model

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& \text{minimize} \quad \sum_{r=1}^s u_{r,p} \sum_{j \neq p} y_{r,j} + \mu \\
& \text{subject to} \quad \sum_{i=1}^m v_{i,p} \sum_{j \neq p} x_{i,j} = 1 \\
& \quad \sum_{r=1}^s u_{r,p} y_{r,j} - \sum_{i=1}^m v_{i,p} x_{i,j} + \mu \leq 0 \quad \forall j \neq p \\
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Malevolent - ALL - Output oriented model

$$\begin{aligned}
& \text{minimize} \quad \sum_{i=1}^m v_{i,p} \sum_{j=1}^n x_{i,j} + \nu \\
& \text{subject to} \quad \sum_{r=1}^s u_{r,p} \sum_{j=1}^n y_{r,j} = 1 \\
& \quad \sum_{i=1}^m v_{i,p} x_{i,j} - \sum_{r=1}^s u_{r,p} y_{r,j} + \nu \geq 0 \quad \forall j \neq p \\
& \quad \sum_{i=1}^m v_{i,p} x_{i,j} - \Phi_{p,p} \sum_{r=1}^s u_{r,p} y_{r,p} + \nu = 0 \\
& \quad v_{i,p}, u_{r,p} \geq 0 \\
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