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(DEA)

TFP

Decision Making Unit

(DMU)

TFP

(Alirezaei et al. 2007) .

(Alirezaei et al. 2005) .

(DEA)

(Abbasiyan and Mehregan 2007) .

(DEA)

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DEA/AHP CEM•A&P

(Safaie Qadyklaye et al. 2005) .

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Data Envelopment Analysis

.(Azar et al . 2005)

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.(Farrell 1957)

$$\begin{aligned}
 & u_{ro}, v_{io} \geq 0 \\
 & i = 1, 2, \dots, n \quad r = 1, 2, \dots, s \\
 & j = 1, 2, \dots, m \\
 & \quad \quad \quad 0 \quad \quad \quad : u_{ro} \\
 & \quad \quad \quad 0 \quad \quad \quad : v_{io} \\
 & \quad \quad \quad 0 \quad \quad \quad : Y_{ro} \\
 & \quad \quad \quad 0 \quad \quad \quad : X_{io} \\
 & \quad \quad \quad \quad \quad \quad : Y_{rj} \\
 & \quad \quad \quad \quad \quad \quad : X_{ij} \\
 & \quad \quad \quad \quad \quad \quad : r, i, j
 \end{aligned}$$

(Cooper) (Edwardo)

(Charnes)

CCR
CCR (Charnes et al. 1978)

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$$\begin{aligned}
 & \text{Min } \theta \\
 & S.T \quad - \sum_{r=1}^s u_r Y_{ro} + \sum_{r=1}^s \lambda_j Y_{rj} \geq 0 \\
 & \theta \sum_{i=1}^m v_i X_{io} - \sum_{i=1}^m \lambda_j X_{ij} \geq 0 \quad (2) \\
 & \quad \quad \quad \lambda > 0
 \end{aligned}$$

(Banker)

BCC

CCR

(Banker et al. 1984)

$$j = 1, 2, \dots, m$$

$$N \times 1 \quad \lambda$$

$$\theta$$

DEA

$$\theta \leq 1$$

CCR

$$\begin{aligned}
 & \text{MAX } \frac{\sum_{r=1}^s u_{ro} Y_{ro}}{\sum_{i=1}^n v_{io} X_{io}} \\
 & S.T \quad \frac{\sum_{r=1}^s u_{ro} Y_{rj}}{\sum_{i=1}^n v_{io} X_{ij}} \leq 1 \\
 & \quad \quad \quad ()
 \end{aligned}$$

DEA

$$\text{Min } \theta$$

$$\text{S.t. } - \sum_{r=1}^s u_r Y_{ro} + \sum_{r=1}^s \lambda_j Y_{rj} \geq 0$$

$$\theta \sum_{i=1}^m v_i X_{io} - \sum_{i=1}^m \lambda_j X_{ij} \geq 0$$

$$\begin{aligned} NI'\lambda &\leq 1 \\ \lambda &> 0 \end{aligned}$$

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CCR

BCC DEA

CCR

CCR

BCC

DMU

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DMU

DMU

$$\text{Min } \theta$$

$$\text{S.t. } - \sum_{r=1}^s u_r Y_{ro} + \sum_{r=1}^s \lambda_j Y_{rj} \geq 0$$

$$\theta \sum_{i=1}^m v_i X_{io} - \sum_{i=1}^m \lambda_j X_{ij} \geq 0 \quad ()$$

$$NI'\lambda = 1$$

$$\lambda > 0$$

DMU

DMU

$$Max D_k$$

$$s.t :$$

$$-D_k Y_{11} + (Y_{11}\lambda_1 + Y_{21}\lambda_2 + \dots) \geq 0$$

$$\dots$$

$$-D_k Y_{1j} + (Y_{1j}\lambda_1 + Y_{2j}\lambda_2 + \dots) \geq 0 \quad ()$$

$$X_{11} - (X_{11}\lambda_1 + X_{21}\lambda_2 + \dots) \geq 0$$

$$X_{li} - (X_{li}\lambda_1 + X_{2i}\lambda_2 + \dots) \geq 0$$

$$\lambda_t \geq 0$$

$$t = 1, 2, 3, \dots$$

K DMU

=D

= λ

DMU

j

=Y_{li}

DMU

i

=X_{li}

CCR

BCC

DEA

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