國立臺北大學自然資源與環境管理研究所
105 學年度第二學期『環境系統分析專題』

課程講義(06)：績效評估與資料包絡分析
Performance Evaluation and Data Envelopment Analysis

- DATA ENVELOPMENT ANALYSIS
  - □ Performance, Efficiency, and Productivity
    - ⇨ CP 值（Cost-Performance value）、BC Ratio (Benefit/Cost)、資源/能源生產力、Eco
    - ⇨ 效率評估方法：平衡計分卡（Balance Score Card, BSC）、比例分析法（Ratio Analysis）、迴歸分析法（Regression Analysis）、財務比率分析法、多準則評估法、生產力及生產效率分析法、資料包絡分析法 (http://www.wunan.com.tw/www2/download/preview/1FQF.PDF)
  - □ Total Factor Productivity (TFP) vs. Production Possibility Set (PPS)
  - □ Key Components of the Data Envelopment Analysis (DEA)
    - ⇨ Decision Making Unit (DMU) => Technical vs. Scale Efficiencies; Reference (Peer) DMU
    - ⇨ Inputs and Outputs => Formulation Orientations => Returns to Scale
  - □ Formulations of the Charnes, Cooper, and Rhodes (CCR) DEA Model

Table 1.1 CCR DEA model

Input-oriented

Envelopment model	Multiplier model
$\min \theta - \varepsilon \left(\sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_r^+ \right)$	$\max z = \sum_{r=1}^{s} \mu_r y_{ro}$
subject to	subject to
$\sum_{j=1}^{n} x_{ij}\lambda_j + s_i^- = \theta x_{io} \quad i = 1, 2, \ldots, m;$	$\sum_{r=1}^{s} \mu_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \leq 0$
$\sum_{j=1}^{n} y_{rj}\lambda_j - s_r^+ = y_{ro} \quad r = 1, 2, \ldots, s;$	$\sum_{i=1}^{m} v_i x_{io} = 1$
$\lambda_j \geq 0 \qquad j = 1, 2, \ldots, n$	$\mu_r, v_i \geq \varepsilon > 0$

(Cooper et al., 2011, Table 1.1, p.13)

  - □ Variable Return to Scale (VRS) => Banker, Charnes, and Cooper (BBC) Model
  - □ Malmquist Productivity Indexes and DEA

- HOMEWORK #3 (2017/04/10 Due)：*Solve* the second example (7 DMUs with 2 inputs) presented by **Liu** using What'sBest, LINGO, and Open Source DEA. After finding the efficient frontier, please use Euler Math Toolbox to illustrate the results.