Week 8 and 9

Data Envelopment Analysis

A non-parametric mathematical method to find the production frontier.

DEA Logic

- Using a DMU's weights, if it can't achieve an efficiency of 1, then it is truly efficient.
- Using a DMU's weight, if an other DMU gets an efficiency of 1, then that other DMU is really good!

Efficiency

$$\frac{\text{Weighted Output}}{\text{Weighted Input}}$$

For a particular DMU k, the efficiency is:

$$E_k = \frac{y_{1k}o_{1k} + y_{2k}o_{2k} + .. + y_{Mk}o_{Mk}}{x_{1k}o_{1k} + x_{2k}o_{2k} + .. + x_{Nk}o_{Nk}}$$

Optimisation Problem

- Each DMU tries to maximize their own efficiency by adjusting the weights assigned to the inputs and the outputs.
- Constraint: No DMU should get efficiency more than 1.

$$\begin{gathered}\text{Max } E_k \\ \text{subject to } E_k \leq 1, k = 1, 2, .., k \\ \text{Decision variables: } x_{ik}, y_{jk} \geq 0, \forall i, \forall j\end{gathered}$$