Elements of Computational Intelligence

Data Envelopment Analysis

Case study report

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I1, Mondays, at 11.45

1. **Analyzed problem**

We had to analyze efficiency of 19 stores from pharmacy-consmetics-hygiene sector in Portugal, evaluated on 5 inputs and 2 outputs.

Inputs:

* Average stock - Average value of inventory (in euros);
* Number of employees - Number of full-time equivalent employees;
* Salary costs - Total cost with salaries (in euros);
* Rent - Cost of space (in euros);
* Area - Total area of the store (m^2)

Outputs:

* Global sales - Global value of sales (in euros);
* Family 4 sales/Global sales - Proportion of Family 4 products in global sales

1. **Chosen model**

The problem stated above has been solved using **Banker, Charnes, and Cooper (BCC)** Data Envelopment Analysis model.

1. **Efficiency scores**

Efficiency scores obtained by model for all car garages are presented in the table below.

|  |  |
| --- | --- |
| **Store** | **Efficiency score** |
| s1 | 0.987 |
| s2 | 1 |
| s3 | 0.811 |
| s4 | 1 |
| s5 | 1 |
| s6 | 0.985 |
| s7 | 1 |
| s8 | 0.766 |
| s9 | 1 |
| s10 | 1 |
| s11 | 0.874 |
| s12 | 1 |
| s13 | 1 |
| s14 | 0.758 |
| s15 | 1 |
| s16 | 0.956 |
| s17 | 0.812 |
| s18 | 1 |
| s19 | 1 |

1. **Efficient units**

There are 11stores which perform efficiently:

* s2,
* s4,
* s5,
* s7
* s9
* s10
* s12
* s13
* s15
* s18
* s19

1. **Inefficient units**

There are **8** inefficient stores: **s1, s3, s6, s8, s11, s14, s16, s17**. To make them efficient they need to reduce their inputs by the following values:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Average stock** | **Number of employees** | **Salary costs** | **Rent** | **Area** |
| s1 | 4660.24 | 1.33 | 1978.15 | 84099.84 | 2.75 |
| s3 | 118843.85 | 3.53 | 47761.03 | 245453.73 | 142.17 |
| s6 | 4485.82 | 0.33 | 14924.33 | 19638.62 | 3.11 |
| s8 | 82879.53 | 3.25 | 37646.94 | 71455.83 | 151.94 |
| s11 | 38815.01 | 1.43 | 25099.07 | 21691.66 | 80.68 |
| s14 | 146080.49 | 6.15 | 64137.41 | 155156.83 | 148.13 |
| s16 | 44934.94 | 0.53 | 40324.33 | 7421.52 | 9.14 |
| s17 | 66790.99 | 2.21 | 24442.42 | 34073.33 | 61.17 |