**Innovative Approaches to Centralized Resource Allocation with Customized Returns to Scale**

**Tables**

**Table 2** Data set

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Efficiency on | Efficiency on | Efficiency on | Output2 | Output1 | Input3 | Input2 | Input1 | DMUs |
| 0.8074 | 0.7991 | 0.7991 | 8 | 65 | 5 | 3 | 10 | **DMU1** |
| 0.6177 | 0.6177 | 0.6177 | 10 | 53 | 6 | 3 | 12 | **DMU2** |
| 0.6088 | 0.5598 | 0.5598 | 5 | 61 | 4 | 4 | 17 | **DMU3** |
| 0.6352 | 0.6352 | 0.6352 | 6 | 49 | 6 | 2 | 8 | **DMU4** |
| 0.8185 | 0.8185 | 1 | 12 | 74 | 8 | 2 | 10 | **DMU5** |
| 1 | 0.7628 | 0.7628 | 5 | 50 | 4 | 3 | 6 | **DMU6** |
| 0.5433 | 0.4920 | 0.4920 | 7 | 39 | 5 | 4 | 11 | **DMU7** |
| 0.3549 | 0.3210 | 0.3210 | 6 | 45 | 7 | 5 | 12 | **DMU8** |
| 0.4727 | 0.4727 | 1 | 15 | 53 | 10 | 3 | 15 | **DMU9** |
| 1 | 1 | 1 | 6 | 72 | 5 | 5 | 5 | **DMU10** |
| 0.6380 | 0.6380 | 0.6380 | 8 | 38 | 6 | 2 | 7 | **DMU11** |
| 1 | 1 | 1 | 6 | 60 | 7 | 1 | 11 | **DMU12** |
| 0.5438 | 0.4857 | 0.4857 | 7 | 52 | 5 | 3 | 18 | **DMU13** |
| 1 | 1 | 1 | 14 | 35 | 8 | 2 | 14 | **DMU14** |
| 1 | 1 | 1 | 10 | 71 | 6 | 2 | 5 | **DMU15** |
| 1 | 1 | 1 | 13 | 59 | 9 | 1 | 4 | **DMU16** |
| 1 | 0.7098 | 0.7098 | 6 | 48 | 4 | 3 | 9 | **DMU17** |
| 1 | 0.6158 | 0.6158 | 5 | 37 | 5 | 2 | 8 | **DMU18** |
| 1 | 1 | 1 | 7 | 77 | 3 | 4 | 14 | **DMU19** |
| 1 | 1 | 1 | 11 | 39 | 6 | 3 | 10 | **DMU20** |
| - | - | - | 167 | 1077 | 119 | 57 | 206 | **Summation** |

**Table 3** Targets obtained from solving Model 8

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Efficiency | t" | t' | Output2 | Output1 | Input3 | Input2 | Input1 | DMUs |
| 0.9673 | 1 | 0.5 | 7.5 | 53.25 | 4.5 | 1.5 | 7.7424 | **DMU1** |
| 0.9670 | 1 | 0.5 | 9 | 63.9 | 5.4 | 1.8 | 9.1326 | **DMU2** |
| 0.9873 | 1 | 0.5 | 6 | 42.6 | 3.6 | 1.2 | 5.8496 | **DMU3** |
| 1 | 1 | 0.5 | 9 | 63.9 | 5.4 | 1.8 | 8.2870 | **DMU4** |
| 1 | 1 | 0.5 | 11.0211 | 65.8112 | 7.2 | 1.5708 | 8.2870 | **DMU5** |
| 1 | 1 | 0.5 | 5.7210 | 35.9746 | 3.6 | 0.9210 | 8.2870 | **DMU6** |
| 0.9695 | 1 | 0.5 | 7.0826 | 43.3361 | 4.5 | 1.0826 | 8.2870 | **DMU7** |
| 0.9209 | 1 | 0.5 | 9.8057 | 58.0592 | 6.3 | 1.4057 | 8.2870 | **DMU8** |
| 1 | 1 | 0.5 | 13 | 59 | 9 | 1 | 4 | **DMU9** |
| 0.7802 | 1 | 0.5 | 7.5 | 53.25 | 4.5 | 1.5 | 12.5309 | **DMU10** |
| 1 | 1 | 0.5 | 4.9983 | 47.7756 | 5.4 | 0.8584 | 12.5309 | **DMU11** |
| 1 | 1 | 0.5 | 10.3 | 69.8 | 6.3 | 1.9 | 12.5309 | **DMU12** |
| 0.7802 | 1 | 0.5 | 7.5 | 53.25 | 4.5 | 1.5 | 12.5309 | **DMU13** |
| 0.8889 | 1 | 0.5 | 11.2 | 66.2 | 7.2 | 1.6 | 12.5309 | **DMU14** |
| 0.8342 | 1 | 0.5 | 9 | 63.9 | 5.4 | 1.8 | 12.5309 | **DMU15** |
| 0.7778 | 1 | 0.5 | 12.1 | 62.6 | 8.1 | 1.3 | 12.5309 | **DMU16** |
| 0.7262 | 1 | 0.5 | 6 | 42.6 | 3.6 | 1.2 | 12.5309 | **DMU17** |
| 0.7471 | 1 | 0.5 | 7.3272 | 49.1457 | 4.5 | 1.3272 | 12.5309 | **DMU18** |
| 0.6723 | 1 | 0.5 | 4.5 | 31.95 | 2.7 | 0.9 | 12.5309 | **DMU19** |
| 0.7731 | 1 | 0.5 | 8.4441 | 50.6976 | 5.4 | 1.2441 | 12.5309 | **DMU20** |
|  | - | - | 167 | 1077 | 107.1 | 27.4098 | 206.0001 | **Summation** |

**Table 4** Targets obtained from solving Model 10

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Efficiency | t" | t' | Output2 | Output1 | Input3 | Input2 | Input1 | DMUs |
| 1 | 0.97 | 0.49 | 8.6145 | 65 | 5 | 2.0884 | 11.2058 | **DMU1** |
| 1 | 0.97 | 0.49 | 10 | 53 | 6 | 1.6821 | 5.8345 | **DMU2** |
| 1 | 0.97 | 0.49 | 7.3253 | 61 | 4 | 2.3213 | 5.8345 | **DMU3** |
| 1 | 0.97 | 0.49 | 6 | 49 | 6 | 0.8307 | 8.0923 | **DMU4** |
| 1 | 0.97 | 0.49 | 12 | 74 | 8 | 1.7599 | 6.9704 | **DMU5** |
| 1 | 0.97 | 0.49 | 6.7952 | 50 | 4 | 1.5261 | 11.4248 | **DMU6** |
| 0.6935 | 0.97 | 0.49 | 7 | 39 | 5 | 0.7793 | 10.7433 | **DMU7** |
| 1 | 0.97 | 0.49 | 6 | 45 | 5.6972 | 0.7535 | 11.4248 | **DMU8** |
| 1 | 0.97 | 0.49 | 15 | 61.5909 | 10 | 1.3636 | 11.2058 | **DMU9** |
| 0.4910 | 0.97 | 0.49 | 6 | 72 | 5 | 5 | 11.2058 | **DMU10** |
| 1 | 0.97 | 0.49 | 8 | 38 | 5.6855 | 0.6432 | 11.2058 | **DMU11** |
| 1 | 0.97 | 0.49 | 6 | 60 | 7 | 1 | 11.2058 | **DMU12** |
| 0.8213 | 0.97 | 0.49 | 7 | 52 | 5 | 1.2834 | 11.2058 | **DMU13** |
| 1 | 0.97 | 0.49 | 14 | 35 | 8 | 2 | 11.2058 | **DMU14** |
| 1 | 0.97 | 0.49 | 10 | 71 | 6 | 2 | 11.2058 | **DMU15** |
| 1 | 0.97 | 0.49 | 13 | 59 | 9 | 1 | 11.2058 | **DMU16** |
| 1 | 0.97 | 0.49 | 6.6988 | 48 | 4 | 1.3815 | 11.2058 | **DMU17** |
| 0.7459 | 0.97 | 0.49 | 5 | 37 | 4.7042 | 0.6197 | 11.2058 | **DMU18** |
| 1 | 0.97 | 0.49 | 7 | 77 | 3 | 4 | 11.2058 | **DMU19** |
| 0.6602 | 0.97 | 0.49 | 11 | 39 | 6 | 3 | 11.2058 | **DMU20** |
|  |  |  | 172.4337 | 1085.59 | 117.0869 | 35.0327 | 205.9999 | **Summation** |

**Table 5** Targets obtained from solving Model 12

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Efficiency | t" | t' | Output2 | Output1 | Input3 | Input2 | Input1 | DMUs |
| 1 | 1.023 | 1 | 7.6 | 61.75 | 5 | 2.4521 | 18 | **DMU1** |
| 1 | 1.023 | 1 | 9.5 | 68.5 | 6 | 1.9444 | 18 | **DMU2** |
| 1 | 1.023 | 1 | 6.0452 | 57.95 | 4 | 3.0151 | 4 | **DMU3** |
| 1 | 1.023 | 1 | 6.0053 | 46.55 | 5.5026 | 1.8325 | 4 | **DMU4** |
| 1 | 1.023 | 1 | 11.4 | 70.3 | 7.2234 | 1.7688 | 4 | **DMU5** |
| 1 | 1.023 | 1 | 5 | 50 | 4 | 3 | 4 | **DMU6** |
| 1 | 1.023 | 1 | 6.65 | 51.85 | 5 | 2.275 | 4 | **DMU7** |
| 0.9334 | 1.023 | 1 | 6 | 60 | 7 | 1 | 6.7992 | **DMU8** |
| 1 | 1.023 | 1 | 14.25 | 64.6731 | 9.8654 | 1.0962 | 13.7971 | **DMU9** |
| 0.5969 | 1.023 | 1 | 6 | 72 | 5 | 5 | 13.7971 | **DMU10** |
| 1 | 1.023 | 1 | 7.6 | 57.2 | 5.8 | 1.8444 | 13.7971 | **DMU11** |
| 1 | 1.023 | 1 | 6 | 60 | 7 | 1 | 4 | **DMU12** |
| 1 | 1.023 | 1 | 6.65 | 51.85 | 5 | 2.275 | 4 | **DMU13** |
| 1 | 1.023 | 1 | 13.3 | 44.8 | 8 | 1.7667 | 13.7971 | **DMU14** |
| 1 | 1.023 | 1 | 10 | 71 | 6 | 2 | 13.2431 | **DMU15** |
| 1 | 1.023 | 1 | 13 | 59 | 9 | 1 | 13.2431 | **DMU16** |
| 0.9084 | 1.023 | 1 | 5.7 | 52.65 | 4 | 3 | 13.2431 | **DMU17** |
| 1 | 1.023 | 1 | 5 | 37 | 5 | 2 | 13.2431 | **DMU18** |
| 1 | 1.023 | 1 | 7 | 77 | 3 | 4 | 13.2431 | **DMU19** |
| 1 | 1.023 | 1 | 10.45 | 63.8 | 6 | 2.3 | 13.7971 | **DMU20** |
|  |  |  | 163.1505 | 1177.873 | 117.3914 | 44.5701 | 206 | **Summation** |

**Table 6** Targets obtained from solving Model 5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Output2 | Output1 | Input3 | Input2 | Input1 | DMUs |
| 10 | 71 | 6 | 2 | 5 | **DMU1** |
| 10 | 71 | 6 | 2 | 5 | **DMU2** |
| 6 | 48 | 4 | 3 | 9 | **DMU3** |
| 10 | 71 | 6 | 2 | 5 | **DMU4** |
| 10 | 71 | 6 | 2 | 5 | **DMU5** |
| 10 | 71 | 6 | 2 | 5 | **DMU6** |
| 10 | 71 | 6 | 2 | 5 | **DMU7** |
| 10 | 71 | 6 | 2 | 5 | **DMU8** |
| 10 | 71 | 6 | 2 | 5 | **DMU9** |
| 10 | 71 | 6 | 2 | 5 | **DMU10** |
| 6 | 48 | 4 | 3 | 9 | **DMU11** |
| 10 | 71 | 6 | 2 | 5 | **DMU12** |
| 6 | 48 | 4 | 3 | 9 | **DMU13** |
| 10 | 71 | 6 | 2 | 5 | **DMU14** |
| 6 | 48 | 4 | 3 | 9 | **DMU15** |
| 8.3266 | 61.3778 | 5.16 | 2.4184 | 6.6734 | **DMU16** |
| 5 | 37 | 5 | 2 | 8 | **DMU17** |
| 5.6734 | 50.4685 | 4.33 | 2.6734 | 10.0203 | **DMU18** |
| 7 | 77 | 3 | 4 | 14 | **DMU19** |
| 7 | 77 | 3 | 4 | 14 | **DMU20** |
| 167 | 1275.85 | 102.49 | 49.09 | 143.69 | **Summation** |