Appendix 1: Six nursing homes

1. Results of CCR model

1.1 Lingo codes for solving CCR model

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MODEL:

! Data Envelopment Analysis of Decision Maker Efficiency;
SETS:
   DMU/1..6/: SCORE; ! The decisionmaking units; Each decision making unit has a score to be computed;
   FACTOR/1..4/: ! There is a set of factors, input & output;

   DDX( DMU, FACTOR): X; ! F(I, J) = Jth factor of DMU I; W; ! Weights used to compute DMU I's score;
   DDX/1..6/: ACE;
   IX( DMU, DMU): INPUT, OUTPUT, CE;
ENDSETS

DATA:

   NINPUTS = 2; ! The first NINPUTS factors are inputs;
   X =
   1.5  0.2  14  35
   4    0.7  14  210
   3.2  1.2  42  105
   5.2  2    28  420
   5.5  1.2  19  250
   5.2  0.7  14  150;
ENDDATA

! Try to make everyone's score as high as possible;
MAX = $SUM( DMU(I): SCORE(I));

! The LP for each DMU to get its score;
#FOR( DMU(I):SCORE(I) = $SUM( FACTOR(J): J $GT# NINPUTS: X(I, J) * W(I, J));

! Sum of inputs/denominator = 1;
$SUM( FACTOR(J): J $LT# NINPUTS: X(I, J) * W(I, J)) = 1;

! Using DMU I's weights, no DMU can score better than 1,
! Note Numer/Denom <= 1 implies Numer <= Denom;
#FOR( DMU(K): SUM( FACTOR(J): J $GT# NINPUTS: X(K, J) * W(I, J)) <= $SUM( FACTOR(J): J $LT# NINPUTS: X(K, J) * W(I, J)));

! The weights must be greater than zero;
#FOR( DDX( I, J): W(I,J) > 0);
END
```

For Help, press F1
- 1.2 Results

(1) Efficiency scores of each DMU

![Image showing efficiency scores](image1.png)

(2) Weights from CCR model

![Image showing CCR model weights](image2.png)
2. Results of benevolent model

(1) ACE of each DMU

![Table showing solution report]

(2) CEM

![Table showing solution report]
3. Results of aggressive model

(1) ACE of each DMU

(2) CEM