

\$online

/*

GAMS program used to estimate graph efficiency.

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Reference: Färe, R., S. Grosskopf and C.A.K. Lovell. 1994. Production Frontiers. Cambridge University Press.

*/

/ The following line turns off listing of some elements in the GAMS listing file*/*

\$OFFSYMLIST OFFSYMXREF OFFUELLIST OFFUELXREF

OPTION SOLPRINT=OFF, SYSOUT=OFF, LIMROW=0, LIMCOL=0;

SET INOUT /out1*out6, fix1*fix3, var1, var2/

OUTPUT(INOUT) /out1*out6/

INPUT(INOUT) /fix1*fix3, var1, var2/

OBS /1*200/

SUBOBS(OBS) /1*82/

ACTOBS(OBS);

*/*We have allocated enough memory for 200 observations, but our data set only contains 82 observations (subobs)*/*

*/*Next, define an alias for the set SUBOBS*/*

alias (subobs, subobs1)

/ The include statement below reads in an external datafile which contains a table of observations, inputs and outputs. The files is in comma separated value format (CSV) which can be written from, and read into spreadsheet programs*

The offlisting command means that the data won't be included in the listing file.

*/

\$OFFLISTING

TABLE ACT(OBS,INOUT) INPUT OUTPUT TABLE

\$ondelim

\$INCLUDE "cap1.csv"

\$offdelim

\$ONLISTING

VARIABLES

GAMMA efficiency score
weight(obs) weights
;

POSITIVE Variable weight;

EQUATIONS

CONSTR1(OUTPUT, OBS) DEA constraint for each output
CONSTR2(INPUT, OBS) DEA constraint for each input;

CONSTR1(OUTPUT, ACTOBS).. SUM(SUBOBS, WEIGHT(SUBOBS)*ACT(SUBOBS,OUTPUT))
=G= ACT(ACTOBS,OUTPUT);

CONSTR2(INPUT, ACTOBS).. SUM(SUBOBS,WEIGHT(SUBOBS)*ACT(SUBOBS,INPUT))
=L= Gamma*ACT(ACTOBS,INPUT);

*/*Define a parameter to hold results for each pass through the loop*/*

PARAMETER

score1(obs) objective values
score2(obs) efficiency scores
;

*/*Define an external file to hold results which tell whether model solved at each iteration*/*

file primal2 /te_graph_v2.txt/

/ The file te_res.txt holds information for each pass through the loop so you know the model solved at each iteration*/*

MODEL TE /ALL/;

Te.solprint=2;
te.sovelink=2;

LOOP(SUBOBS1,

ACTOBS(OBS)=NO;
ACTOBS(SUBOBS1)=YES;

SOLVE TE minimizing GAMMA USING LP;

score1(subobs1)=Gamma.1;
score2(SUBOBS1) = GAMMA.1**(1/2);

put primal2;

```
if ((te.modelstat eq 1 and te.solvestat eq 1),  
    put @1, subobs1.tl, @10, "optimal", @20, "normal completion" /  
else  
    put @1, subobs1.tl, @10, te.modelstat:>2:0,  
        @20, te.solvestat:>2:0/  
);  
);
```

*/*The next file is to output results to a file to be imported into a spreadsheet program. Results could also be printed to the listing file with the use of the display command*/*

```
file res /'graph_crs.csv'/ ;  
res.pc=5;  
res.pw=500;  
put res;  
put 'Obs','gamma', 'efficiency';  
put /  
loop (subobs1,  
    put /  
        put subobs1.tl,score1(subobs1), score2(subobs1);  
    );  
putclose;
```