

\$online

/*

GAMS program used to estimate capacity with the hyperbolic graph efficiency measure, with constant returns to scale and undesirable outputs.

Source: Färe, R., J.E. Kirkley, and J.B. Walden. 2007. "Estimating Capacity and Efficiency in Fisheries with Undesirable Outputs." VIMS Marine resource Report N. 2007-6. August 2007.

Author: John B. Walden

NMFS/NEFSC

166 Water St.

Woods Hole, MA 02543

(508) 495-2355

John.Walden@Noaa.Gov

*/

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

\$OFFSYMLIST OFFSYMXREF OFFUELLIST OFFFUELXREF

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

*/*NEXT DEFINE INPUTS AND OUTPUTS. */*

SET INOUT /fix1*fix3, var1*var3, out1*out8/

OUTPUT(INOUT) /out1*out8/

Goutput(OUTPUT) /out1*out6/

Boutput(OUTPUT) /out7, out8/

FIXED(INOUT) /fix1*fix3/

VAR(INOUT) /var1*var3/

OBS /1*1000/

SUBOBS(OBS) /1*102/

ACTOBS(OBS)

;

/ OBS sets up memory for 1000 observations. SUBOBS is the actual number of observations in the data set*/*

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

alias (subobs, subobs1)

\$OFFLISTING

TABLE ACT(OBS,INOUT) INPUT OUTPUT TABLE

\$ondelim

\$INCLUDE "disc1.csv"

\$offdelim

\$ONLISTING

*/*Reads in a csv formatted data set.*/*

VARIABLES

lambda efficiency score
weight(obs) weights
gamma(obs,var)
;

POSITIVE Variable weight, gamma;

EQUATIONS

CONSTR1(GOUTPUT, OBS) DEA constraint for each output
CONSTR2(BOUTPUT, OBS) DEA constraint for BAD Outputs
CONSTR3(FIXED, OBS) DEA constraint for Fixed Inputs
CONSTR4(VAR, OBS) DEA Constraint for Variable Outputs;

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

CONSTR2(BOUTPUT, ACTOBS).. 2*ACT(ACTOBS,BOUTPUT)-LAMBDA*ACT(ACTOBS,BOUTPUT)
-SUM(SUBOBS,WEIGHT(SUBOBS)*ACT(SUBOBS,BOUTPUT)) =E= 0;

CONSTR3(FIXED, ACTOBS).. SUM(SUBOBS,WEIGHT(SUBOBS)*ACT(SUBOBS,FIXED))
-ACT(ACTOBS,FIXED) =L= 0;

CONSTR4(VAR, ACTOBS).. SUM(SUBOBS, WEIGHT(SUBOBS)*ACT(SUBOBS,VAR))
-Gamma(actobs,var)*ACT(ACTOBS,VAR) =L= 0;

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

PARAMETER

score1(obs) efficiency scores
;

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

file primal2 /graph_cap_res.txt/

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

MODEL CAP /ALL/;

cap.solprint=2;

```

cap.solverlink=2;

LOOP(SUBOBS1,

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

    SOLVE CAP maximizing lambda USING LP;

    score1(SUBOBS1) = lambda.l

    put primal2;

    if ((cap.modelstat eq 1 and cap.solvestat eq 1),

        put @1, subobs1.tl, @10, "optimal", @20, "normal completion" /

    else

        put @1, subobs1.tl, @10, cap.modelstat:>2:0,
            @20, cap.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_wd.csv'/ ;

res.pc=5;
res.pw=500;

put res;

put 'Obs','LAMBDA';

put //

loop (subobs1,

    put /

        put subobs1.tl,score1(subobs1):5:2

    );
putclose;

```