```
$oninline
/*
 GAMS program used to estimate capacity output using a distance function with both good and bad output,  variable
returns to scale and weak disposability of the bad 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.


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*/

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

$OFFSYMLIST OFFSYMXREF OFFUELLIST OFFUELXREF

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

/*NEXT DEFINE INPUTS AND OUTPUTS. GOUTPUT are the desirable outputs and BOUTPUT are the undesirable
outputs.*/


SET INOUT /fix1*fix3, var1*var3, out1*out8/
   OUTPUT(INOUT) /out1*out8/
   Goutput(OUTPUT) Desirable outputs   /out1*out6/
   Boutput(OUTPUT) Undesirable Outputs /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

 Beta   efficiency score
 lambda(obs,var) variuable input utilization rate
 weight(obs) weights
;

 POSITIVE Variable weight, lambda;

 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
  CONSTR5   DEA Constraint for Variable Returns to Scale;

  CONSTR1(GOUTPUT, ACTOBS).. SUM(SUBOBS, WEIGHT(SUBOBS)*ACT(SUBOBS,GOUTPUT)) =G=
                  (1+beta)*ACT(ACTOBS,GOUTPUT);

  CONSTR2(BOUTPUT, ACTOBS).. SUM(SUBOBS,WEIGHT(SUBOBS)*ACT(SUBOBS,BOUTPUT)) =E=
                  (1-Beta)*ACT(ACTOBS,BOUTPUT);

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

  CONSTR4(VAR, ACTOBS).. SUM(SUBOBS, WEIGHT(SUBOBS)*ACT(SUBOBS, VAR)) =E=
                   LAMBDA(ACTOBS,VAR)*ACT(ACTOBS,VAR);

  CONSTR5.. SUM(SUBOBS, WEIGHT(SUBOBS)) =E= 1;

/*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 /dd_res_vrs.txt/

 MODEL CAP /All/;

cap.solprint=2;

```
cap.solvelink=2;

LOOP(SUBOBS1,


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

  SOLVE CAP maximizing beta USING LP;


  score1(SUBOBS1) = beta.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 /'dd_vrs_wd.csv'/ ;

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

put res;

put 'Obs','BETA';


put //

 loop (subobs1,

  put /

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

    );
putclose;
```