```
$oninline
/*
 GAMS program used to estimate output oriented technical efficiency
with variable returns to scale.

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This version will estimate technical efficiency for
each vessel, based on an output oriented DEA model.

*/

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

$OFFSYMLIST OFFSYMXREF OFFUELLIST OFFUELXREF

/*NEXT DEFINE INPUTS AND OUTPUTS*/

SET INOUT /y1*y3, x1*x5/
   OUTPUT(INOUT) /y1*y3/
   INPUT(INOUT) /x1*x5/


   OBS /1*200/
   SUBOBS(OBS) /1*50/
   ACTOBS(OBS)

/*We have allocated enough memory for 200 observations, but our
data set only contains 50 observations (subobs)*/


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

alias (subobs, subobs1)

/* The include statement below reads in an external data
file which contains a table of observations, inputs
and outputs. 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 "data_test.csv"
$offdelim

$ONLISTING
```

```
VARIABLES

 theta     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
   CONSTR3    DEA constraint for imposing VRS;

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

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

   CONSTR3.. 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 primal /teout_res.txt/;
```

/*The model defined below consists of three equations.
CONSTR1, CONSTR2, CONSTR3. We use the term ALL in the model statement
rather than listing the equations separately as we did in the
CRS example */

```
 MODEL TEDEA /ALL/;

tedea.solprint=2;      /*Turn off writing results to solution file*/
tedea.solvelink=2;     /*Keep model in memory. Improves solution time*/

 LOOP(SUBOBS1,

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

    SOLVE TEDEA maximizing THETA USING LP;


    score1(SUBOBS1) = theta.l;
```

```
    put primal;

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

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

    else

      put @1, subobs1.tl, @10, tedea.modelstat:>2:0,
          @20, tedea.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 /teoutput.csv/ ;

res.pc=5;

put res;

loop (subobs1,

  put subobs1.tl, score1(subobs1)/
  );
putclose;
```