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$TITLE: M2-4.GMS quick introduction to sets and scenarios using M2-2
*    MAXIMIZE UTILITY SUBJECT TO A LINEAR BUDGET CONSTRAINT
*    same as UTIL-OPT1.GMS but introduces set notation

SET I  Prices and Goods / X1, X2  /;
ALIAS (I, II);

PARAMETER
 M             Income
 RATION        ration of X1 (constraint on max consumption of X1)
 P(I)          prices
 S(I)          util shares;

M = 100;
P("X1") = 1;
P("X2") = 1;
S("X1") = 0.5;
S("X2") = 0.5;
RATION  = 100;


NONNEGATIVE VARIABLES

   X(I)       Commodity demands
   LAMBDAI    Marginal utility of income (Lagrangean multiplier)
   LAMBDAR    Marginal effect of ration constraint;
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VARIABLES

   U         Welfare;

EQUATIONS

   UTILITY
   INCOME
   RATION1
   FOC(I);

UTILITY..    U =E= 2*PROD(I, X(I)**S(I));

INCOME..     M =G= SUM(I, P(I)*X(I));

RATION1..    RATION =G= X("X1");

FOC(I)..     LAMBDAI*P(I) + LAMBDAR$(ORD(I) EQ 1) =G=
                S(I)*X(I)**(-1)*2*PROD(II, X(II)**S(II));

U.L = 100;
X.L(I) = 50;
RATION = 100;
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*  first, solve the model as an nlp, max U subject to income
*  rationing constraint in non-binding

MODEL UMAX /UTILITY, INCOME, RATION1/;
SOLVE UMAX USING NLP MAXIMIZING U;

*  second, solve the model as an mcp, using the two FOC and income
LAMBDAI.L = 1;
LAMBDAR.L = 0;

MODEL COMPLEM /UTILITY.U, INCOME.LAMBDAI, RATION1.LAMBDAR, FOC.X/;
SOLVE COMPLEM USING MCP;



* scenario generation
SETS J indexes different values of rationing constraint /J1*J10/;

PARAMETERS
 RLEVEL(J)
 WELFARE(J)
 LAMRATION(J)
 RESULTS(J, *);

LOOP(J,
 RATION = 110 - 10*ORD(J);
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SOLVE COMPLEM USING MCP;

 RLEVEL(J) = RATION;
 WELFARE(J) = U.L;
 LAMRATION(J) = LAMBDAR.L;

);

RESULTS(J, "RLEVEL") = RLEVEL(J);
RESULTS(J, "WELFARE") = WELFARE(J);
RESULTS(J, "LAMRATION") = LAMRATION(J);

DISPLAY RLEVEL, WELFARE, LAMRATION, RESULTS;

$LIBINCLUDE XLDUMP RESULTS M2-3.XLS SHEET2!B3
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