Examples for Mathematical Programming File Formats

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1 A sample example of linear program

Here we show an example taken from Exercise (2-7) in Chapter 2 in the book.

$$
\begin{aligned}
\text{Max} \quad & v = x_1 + 2x_2 + 3x_3 \\
\text{Subject to} \quad & 12x_1 + 12x_2 + 6x_3 \leq 30, \\
& 4x_1 + 10x_2 + 18x_3 \leq 15, \\
& x_j \geq 0, j = 1, 2, 3.
\end{aligned}
$$

2 Translate to different formats

The corresponding forms of the linear program written in different mathematical programming file formats are as follows:

2.1 AMPL

To use the AMPL solver, we put the model in a *filename.mod* file and our data in a *filename.dat* file. Here we only use *example.mod* file.

```
var x1 >= 0;
var x2 >= 0;
var x3 >= 0;
maximize TOTAL: x1 + 2*x2 + 3*x3;
subject to LIM1: 12*x1 + 12*x2 + 6*x3 <= 30;
subject to LIM2: 4*x1 + 10*x2 + 18*x3 <= 15;
```

2.2 GAMS

The input model is encoded in *example.gms* as:

```
* Example file example.gms
```

```
Free variable TOTAL "TOTAL";
Positive variable x1 "var1";
Positive variable x2 "var2",
Positive variable x3 "var3";

Equations
  obj "max TOTAL"
  lim1 "lim1"
  lim2 "lim2";

obj ..   x1 + 2*x2 + 3*x3 =e= TOTAL;
lim1 ..  12*x1 + 12*x2 + 6*x3 =l= 30;
lim2 ..  4*x1 + 10*x2 + 18*x3 =l= 15;

Model example /all/;
Solve example using lp maximizing TOTAL;
```

2.3 CPLEX

The LP format generated from the algebraic format is:

```
Maximize
    TOTAL: x1 + 2 x2 + 3 x3
Subject to
    LIM1: 12 x1 + 12 x2 + 6 x3 <= 30
    LIM2: 4 x1 + 10 x2 + 18 x3 <= 15
Bounds
    x1 >= 0
    x2 >= 0
    x3 >= 0
End
```

2.4 MPS

The MPS format is column oriented and everything has a name. For details you can also refer to MPS file format.

```
NAME     EXAMPLE
OBJSENSE
    MAX
ROWS
    N    TOTAL
    L    LIM1
    L    LIM2
COLUMNS
    X1    TOTAL    1    LIM1    12
```

```
    X1      LIM2     4
    X2      TOTAL    2    LIM1    12
    X2      LIM2    10
    X3      TOTAL    3    LIM1     6
    X3      LIM2    18
RHS
    RHS1    LIM1    30    LIM2    15
BOUNDS
    LO      BND1    X1    0
    LO      BND1    X2    0
    LO      BND1    X3    0
ENDATA
```