Bruce McCarl's GAMS Newsletter Number 32

This newsletter covers
- A new documentation version
- Developments in the GAMS 23.9 and 24.0 releases
  - Language changes
  - Solvers
  - Interfaces with other programs
- Future courses I will teach

Expanded GAMS User Guide by McCarl et al.

I updated the Expanded User's Guide to reflect 23.9 and 24.0 with changes added here and there. The latest can be found at http://www.gams.com/dd/docs/bigdocs/gams2002/mccarlgamsuserguide.pdf and will be in upcoming GAMS releases.

GAMS Features in Release 23.9 and 24.0

On/OffOrder –Set operations over leads and lags require the subject set to be ordered and predefined, if one wants to use lags and leads on dynamic and/or unordered sets. A dollar control option on/offOrder has been added to locally relax the default requirements. The use of this option comes at a price: the system will not be able to diagnose odd and incorrect formulations and data sets. A small example in Test Library lagd1 illustrates the use of on/offOrder.

Retrieving bound on best possible answer for MIP models – Some GAMS solvers in solving integer programs generate a bound on the objective function value for the best possible solution. Users can access this bound by using the model attribute `objest`. So if solving the problem `mymip` one could say `xx=mymip.objest;`.

$ commands can start in columns other than one – Historically all compile time $ commands had to start in column 1. One can now (at last) move them to start elsewhere but needs to add an additional $. So one can have the sequence (where the first command starts in column 1)

```
$include myfile1
    $$include myfile2
    $$setglobal it
    $$label gohere
```

Sending a message to a window on a windows machine – A new `put_utility` feature has been added that lets a user send a message to a named window on a Windows machine. The syntax is

```
put_utility 'WinMsg' / 'WindowTitle' / 'Message';
```

Now we need a way to form a text variable to send somewhere (Yes I know you can awkwardly do that through put_utility).

Identifying File differences - The IDE has now an integrated Text differ feature that will compare two text files and report on any found differences. For now this is done through the GAMSIDE file menu using the feature Diff Textfiles. In the near future this will move to the Utilities menu and will also remember the names of previous file comparisons (the release notes indicate this has happened but it has not in any release available as of this writing).

Using xlsb files in GDXXRW – GDXXRW now can work with files with the Excel Binary Workbook files (file extension `.xlsb`).

Dumping GAMS data to other GAMS files or a CSV – GDXDUMP can take the symbols in a GDX file and write them into file that is formatted either
- As txt in GAMS readable commands that can be used in subsequent GAMS runs or
- As a CSV file.

The information that GDXDUMP will write in the output file is
- Data for a selected set, parameter, variable or equation (under all three of the output options when a specific item is named using the SYMB option)
- Data for all sets, parameters, variables and equations (Under *normal* option when the SYMB is not used)
- Data on solution items (variables and equations) formatted in a fashion suitable for import as a basis in another GAMS program using the GAMSBAS format where the marginals and levels are output (as discussed in the Expanded GAMS user guide under the heading *Advanced basis formation in GAMS* and also in the writeup for the now obsolete GAMSBAS solver in *http://agecon2.tamu.edu/people/faculty/mccarl-bruce/papers/550.pdf*).

There are some peculiarities in the GDXDUMP. Namely
- Under the *CSV* format it only creates output when a symbol is selected using the SYMB syntax.
- Under the *CSV* format when the requested symbol is a variable or an equation one only gets the level values not the marginal, under the other formats one gets all items.
- Under the *gamsbas* format one gets all variables and equations when the SYMB syntax is **not** used.

More options are available and are described in the gdxutils.pdf writeup as accessible at http://www.gams.com/dd/docs/tools/gdxutils.pdf or through the GAMSIDE help under docs and tools

An example exercising this is

```
execute 'gams agreste gdx=junk'
execute 'gdxdump junk format=CSV output=filecsv.csv symb=llab'
execute 'gdxdump junk format=CSV output=filecsv2.csv symb=xcrop'
execute 'gdxdump junk format=CSV output=filecsv3.csv symb=landb'
execute 'gdxdump junk format=gamsbas output=filegamsbas.gms symb=xcrop'
```

```
execute 'gdxdump junk format=gamsbas output=filegamsbas2.gms'
execute 'gdxdump junk output=filenormal.gms symb=llab'
execute 'gdxdump junk format=normal output=filenormal1.gms symb=xcrop'
execute 'gdxdump junk output=filenormal2.gms symb=landb'
execute 'gdxdump junk output=fileall.gms'
```

Solvers

S**olver Manual has been split into two parts**: *I The Commercial Solvers* and *II The Free Solvers*. Printed versions of the manual will only contain part I. The on-line/PDF version has both parts available.

New libraries are included for BARON, BONMIN, CBC, CONOPT, COUENNE, CPLEX, GLOMIQO , GUROBI, SCIP, LINDO, MOSEK, OPTIMIZATION SERVICES, OS, SCIP, SNOPT, SOPLEX, and XPRESS

A new LP solver is included named SULUM that is a high performance simplex based optimizer for Linear Programming Problems and is documented in the commercial solver part of the Solver manual.

Solvers with new features - BARON**,** CBC, CPLEX, GLOMIQO, GUROBI, SCIP and XPRESS all seem to have the largest changes in terms of new features.

Interfaces with External programs

Developments have occurred regarding a number of ways GAMS interfaces with external programs. Several categories are discussed below

APIs - GAMS provides several API's that allow interfaces to and from other applications. These permit exchanges of input data and model results with and in-memory representation of the data in the GAMS program. They also permit one to create and run GAMS models plus manipulate GAMS options. Furthermore, they introduce a way to efficiently solve a sequence of closely related models. There are Java, Python and .NET versions. These versions are documented in: GAMS Java API, Javadoc version, GAMS Python API, and GAMS .NET API. These documents reside in the /docs/API subdirectory of the GAMS system directory or can be accessed through the IDE help under Docs then API. In addition to these APIs, there exist more technical, lower level APIs that permit access to GAMS information from the programming languages **C**, C++, C#, Delphi, Fortran, Java, Python, and Visual Basic. These are overviewed with examples in GAMSx API, GDX API, and Option API. Additional information for GDX interfacing is available in CHM and PDF forms under the GAMSIDE help under API and EXPERT-LEVEL.

Interfacing with the R language -- A suite of utilities has been released to import export data from R and allow R to call GAMS. The utilities are called GDXRRW. In turn R users can employ the visualization and other operational capabilities of R to GAMS data directly within an executing R program. The suite is described in the GDXRRW Wiki and some of the capabilities are illustrated in http://www.gams.com/presentations/informs2013_gdxrrw.pdf plus at http://www3.lei.wur.nl/gamstools/R%20for%20Gams%20Users.docx.

External Equations – the GAMS Test Library now contains a set of examples on use of the =x= syntax to include constraints defined by external programs

Courses offered

I will be teaching
- Basic to Advanced GAMS class July 29, 2013- Aug 2, 2013 (5 days) in the Colorado mountains at Frisco (near Breckenridge). The course bridges from Basic topics to an Advanced GAMS class. Details are given at http://www.gams.com/courses/basic_and_advanced.pdf .
- Basic GAMS class July 29, 2013- July 31, 2013 (3 days) in the Colorado mountains at Frisco (near Breckenridge). The course starts assuming no GAMS background. Details are given at http://www.gams.com/courses/basic.pdf.
- Advanced GAMS class July 31, 2013- Aug 2, 2013 (3 days) in the Colorado mountains at Frisco (near Breckenridge). The course starts assuming users have a GAMS background. Details are given at http://www.gams.com/courses/advanced.pdf .
- Further information and other courses are listed on http://www.gams.com/courses.htm.

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