

# GAUSS Mathematical and Statistical System™

## 8.0 Update


### New GAUSS 8.0

#### New features and enhancements:

- Sparse matrix data type
- GAUSS Profiler
- Sparse matrix and structure support in GAUSS Data Archives
- Several new GDA functions
- New functions for testing hypotheses about constrained models
- New standard deviation functions
- Support for adding structures to libraries
- Support for extra library paths
- Improved file/line number handling in error returns

#### Available Platforms:

32-bit: Windows, Linux, Mac OS X, HP UX11  
 64-bit: Windows Itanium 2, Linux AMD, Mac OS X, Solaris

 With the introduction of the new sparse matrix data type and the GAUSS Profiler, the functionality of GAUSS and your ability to optimize your programs increase dramatically.

### Sparse Matrix Data Type

New sparse matrix data type allows for the use of sparse matrices in many matrix functions and operators, including:

~		*	.*
+	-	/	./
/=	./=	==	==
>	.>	>=	.>=
<	.<	<=	.<=
~	abs	cols	maxc
maxv	minc	minv	print
rows	scalerr	show	type

### New Sparse Matrix Functions

The following new functions have been added for creating and manipulating sparse matrices:

denseToSp	denseToSpRE
packedToSp	spCreate
spDenseSubmat	spDiagRvMat
spEye	spGetNZE
spNumNZE	spOnes
spScale	spSubmat
spToDense	spTrTDense
spTScalar	spZeros

### GAUSS Profiler

The new GAUSS Profiler is an important new feature that allows you to optimize your programs rapidly. The GAUSS Profiler produces a report of how much time your GAUSS programs are spending on each line and in each called procedure, giving you the information needed to optimize your programs.

### Hypotheses Testing Functions

Two new functions in GAUSS implement a new method for testing hypotheses in models with constraints on parameters described in *Constrained Statistical Inference* by Mervyn J. Silvapulle and Pranab K. Sen. It is well known that current methods for computing standard errors for constrained parameters are only approximate. These new functions are the only correct method for computing these standard errors, and they are only available in GAUSS at this time.

**ConScore** computes the local score statistic for the hypothesis  $H(\theta) = 0$  vs.  $H(\theta) \geq 0$ , where



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theta is the vector of estimated parameters, and H() is a constraint function of the parameters. The model with  $H(\theta) = 0$  is estimated, and the Hessian, and optionally the cross-product of the Jacobian, and the gradient are saved. Then **ConScore** is called with this information along with the specification for  $H(\theta) \geq 0$ . The probability of the local score statistic is also computed using a simulation method employing the quadratic programming solver.

**ConScore** computes both the statistic and its probability. This statistic has a chi-bar-square distribution. Another GAUSS function, **ChiBarSquare**, computes the probability of a chi-bar-square distributed statistic given its covariance matrix and the specification of  $H(\theta) \geq 0$ .

## Additional New Features

### • New in GAUSS Data Archives

- Sparse matrix and structure support in GDA's, including support in existing GDA functions as well as the following new functions:
- **gdaGetStructType**
- **gdaReadSparse**
- **gdaReadStruct**
- Support added for reading from and writing to GDA's created on other platforms, providing you with an easy

and efficient way to transfer data between platforms

- New GDA functions for saving all or a subset of the variables in a workspace to a GDA (**gdaSave**) and for loading all of the variables in a GDA into a workspace (**gdaLoad**)
- Other new GDA functions:
  - **gdaMoment**
  - **gdaOls**
- **New standard deviation functions:**
  - **astd** – computes standard deviation of each element along one dimension of an N-dimensional array
  - **astds** – 'sample' version of **astd**, which divides by N rather than N-1
  - **stdsc** – 'sample' version of **stdc**, which divides by N rather than N-1
- **Support for adding global structures to libraries**
- **Support for extra library paths** added to the **lib** command and the Lib Tool  
In GAUSS 7.0, an `extra_lib_path` variable was added to the GAUSS configuration file to allow library statements to find files in locations other than the main library path. Now you may also modify and rebuild libraries located in directories that are included in the `extra_lib_path`

with the **lib** command and the Lib Tool

- **Improved file/line number handling in error returns**
- **Other new functions**
  - **asciiload** – loads data stored in an ASCII file into GAUSS
  - **getRow** – retrieves a single row from a matrix
  - **getTrRow** – transposes a matrix and then retrieves a single row from it
  - **maxv** – performs an element-by-element comparison of two matrices and returns the maximum value for each element
  - **minv** – performs an element-by-element comparison of two matrices and returns the minimum value for each element
  - **putvals** – inserts multiple values into a matrix
  - **errorlogat** – Prints an error message to the window and error log file, along with the file name and line number at which the error occurred
  - faster intrinsic **indsav**

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