ABSTRACT

SAS/CALC software provides all-purpose spreadsheet capabilities for information management. Spreadsheets provide robust data modeling behavior. Although financial applications are typical examples, mathematical and statistical applications such as Monte Carlo simulations can also exploit the spreadsheet’s capabilities. This paper highlights the major features including importing and exporting files, two-dimensional and three-dimensional spreadsheets, linking, consolidation, formulas, program entries, integrated graphics, and goal seeking.

Structure

SAS/CALC applications are based on spreadsheets which are tables of rows and columns. Although financial or ledger sheet applications typically come to mind, any information that can be represented as a table of rows and columns can be placed into a spreadsheet.

Display 1 SAS/CALC Spreadsheet

The following data could be represented in a spreadsheet or in a SAS data set for the structure of a spreadsheet is similar to a SAS data set. There are fundamental relationships between the structure of a SAS data set and the structure of a spreadsheet.

Display 2 SAS/CALC Spreadsheet

The ROW4.REVENUE cell is defined as data type CHARACTER.

Display 3 Cell Attributes

An observation in a SAS data set relates to a row in a spreadsheet, a variable in a SAS data set relates to a column in a spreadsheet, and a data value in a SAS data set relates to a cell value in a spreadsheet.

You may prefer to think of a spreadsheet as offering more functionality than a SAS data set. In a SAS data set, all the data values for a given variable must be either character or numeric. This constraint does not exist in a spreadsheet. Some cell values may be character and others may be numeric in a given spreadsheet column. The attributes of a cell is determined by the data placed in that cell.
The ROWS.REVENUE cell is defined as data type NUMERIC.

Display 4 Cell Attributes

In addition to the data in a SAS data set, various cell values can be defined as functions of other cell values. As cell values are edited, the other cell values are updated automatically.

Importing and Exporting Data

SAS/CALC provides direct read/write access to any data stored in a SAS data set or any proprietary data storage format supported by a SAS data engine. Columns and rows can be transposed during the read/write process.

Data step views can be used to process various legacy files.

SAS/ACCESS views are used to process data in other proprietary file structures.

SAS/ACCESS Interface Engines

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Database</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVS</td>
<td>DB2</td>
</tr>
<tr>
<td>CA-DATACOM/DB</td>
<td>ADABAS</td>
</tr>
<tr>
<td>IMS-DLI</td>
<td>ORACLE</td>
</tr>
<tr>
<td>SOLIDS</td>
<td></td>
</tr>
<tr>
<td>VMS</td>
<td>ORACLE</td>
</tr>
<tr>
<td>OS/2</td>
<td>AS/400</td>
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<tr>
<td>Windows</td>
<td>PCFF</td>
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<tr>
<td>UNIX</td>
<td>PCFF</td>
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<td></td>
<td>ODBC</td>
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<td></td>
<td>SYBASE</td>
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<td></td>
<td>SYBASE</td>
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<td></td>
<td>INFORMIX</td>
</tr>
<tr>
<td></td>
<td>SQL Server</td>
</tr>
</tbody>
</table>

Three-Dimensional Spreadsheets

3-D spreadsheets handle data in a single spreadsheet using rows, columns, and pages. Each page has the same row and column dimensions. 3-D spreadsheets are best suited for applications where you would otherwise have several identical spreadsheets. The page dimension adds another level of information. Sometimes the page dimension can be thought of as equivalent to a BY variable in a SAS data set.

Data in 3-D spreadsheet can be viewed four different ways:
- row by column
- column by page
- row by page
- each page in a separate window in either a tile or cascade format.

Display 5 Multiple Page Spreadsheet Tile Format

Calculations

Calculations in a spreadsheet are done by programs which represent sets of calculations together or are done by formulas which are computations assigned to specific cells.

Formulas can be placed in individual cells.

Display 6 Cell Formula
Formulas can be placed in SAS/CALC programs which are stored in PGM catalog entries. The program executes when a RUN, EXEC, or RECALL command is issued or when one or more cells are modified. The programs are written using screen control language.

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Display 7 Program

In addition the SCL program can invoke SAS/FSP and SAS/AF applications.

Spreadsheet Linking and Consolidation

Two or more spreadsheets can be linked together. Cells, columns, rows, pages, and ranges of a linked spreadsheet are referred to in the formula for a cell in the program entry.

Links are first defined for the spreadsheets. In this example the CORPRATE spreadsheet is linked to the EASTERN spreadsheet and the WESTERN spreadsheet.

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Display 8 Multiple Page Spreadsheet

The link names can be used in formula references.

Display 9 Cell Formula

A composite link can point to multiple spreadsheets. Appropriate information is pulled from each spreadsheet. When a spreadsheet is modified, all spreadsheets that are dependent on the modified cell are also updated.

Spreadsheets can also be consolidated. When consolidated, only like-named cell values are imported. The cell values can be added, subtracted, or replaced.

Drill-Down Manager

Drill-down represents a graphical (or text based) representation of linked spreadsheets showing dependencies. You can activate and deactivate spreadsheet links, traverse tree structures, and open spreadsheets using a point-and-click graphical interface.
You can examine any of the spreadsheets as well as deactivate the spreadsheets' contribution to the summary spreadsheet.

Display 11 Drill Down

Integrated Interactive Graphics

Integrated interactive graphics provide you the ability to examine the data in one or more spreadsheets using a variety of graphics:

- bar charts
- line charts
- pie charts
- sequence plots
- view multiple charts simultaneously.

The charts and the spreadsheets are hot-linked together which means changes made to the spreadsheet are automatically updated on the graph.

SAS/GRAPH software is not required to display the graph. However, to save the graph or replay it to a different device driver, SAS/GRAPH software is required.

Goal Seeking

SAS/CALC conducts goal seek, minimization, and what-if analysis.

- goal seek attempts to find the value for the cells specified in the parameter section that allow the target to have the goal value.
- minimization attempts to find the values for the cells specified in the parameter section that allow the target to have the minimum value.
- maximization attempts to find the values for the cells specified in the parameter section that allow the target to have the maximum value.

what-if calculates the value of the target cell for the current value or test value of the parameter cells.

You specify the desired value for the target cell and what parameter cell values are to be modified to reach the desired outcome.

Display 12 Goal Seek

A non-linear surface search method is used to find solutions. The required values for the parameter cells are reported.

Display 13 Goal Seek

SUMMARY

SAS/CALC is a comprehensive application development toolkit for representing data in a table of rows and columns and defining simple and complex functions that define the relationships and modeling behavior of the data.