ABSTRACT

Many end-users, such as executives, do not wish to spend the time necessary to learn to produce their own graphs. Instead they are only interested in viewing the selected data in graphical form. An executive chartbook can provide this capability. An executive chartbook is a catalog of predefined graphs. Executive chartbook users simply find which graph they want to see and enter the catalog name to view the latest data in the chosen form. This paper is a guide of how to develop an executive chartbook using the SAS® System. This paper assumes that the reader is familiar with the SAS System and SAS/GRAPH® Software. The examples include enhancements and new features of Version 5 SAS/GRAPH software.

INTRODUCTION

An executive chartbook system is a tool for viewing preprepared graphs. Properly chosen graphs make the data easier to interpret and the chartbook makes the graphs easy for the users to obtain. The chartbook I have built is a bound collection of 8-1/2 by 11 inch pages of graphics output. Each page contains up to six graphs and a category title. Each graph has a name in the lower left corner (the catalog name) used to select that graph for viewing. The graphs show the original data in various forms. When users choose a graph, they see the most recent data in the chosen form. The graphs are periodically updated to reflect updated data. The responsibility for this updating could be done by an end user but more practically by the data center personnel.

GOALS

I wanted to develop a general process for creating a chartbook as well as a simple example. I decided that the system should be very simple to use and mostly self-recovering from errors. The chartbook developer should also be able to easily add, modify, and delete graphs from the chartbook system. Finally, I decided to develop the system to work both with and without a full-screen environment.

CHOOSING THE GRAPHS

The chartbook developer must work with the end user(s) to determine what charts to put in the chartbook. The type of data being represented strongly influences these choices. The chartbook developer should produce rough copies of graphs to be reviewed by the end user(s) and attempt to represent each relationship in the data in the best form.

CHOOSING THE DEVICES

I wanted to be able to display the graphs in three forms.

1) Interactively on a color terminal,
2) In batch on a color hardcopy device,
3) In batch on a black and white hardcopy device.

The color terminal is anticipated to be the most often used device, since quick viewing can take place in the user's office. Color hardcopy will be available for reports or posting. For large numbers of copies, a black and white original is generated for the copy center. Our users mostly have IBM 3279 terminals so I made that our color terminal. We have a Tektronix 4691 ink jet plotter driven by a Tektronix 4510 rasterizer that I decided to use for both color and black and white hardcopy. Of course many different devices could be supported if they were needed.

DESIGNING THE GRAPHS

I wanted to choose a consistent scheme for titles, footnotes, symbols, and patterns from the beginning. A consistent scheme allows the user to find the parts of the graph they are looking for quicker. The important choices for this scheme are fonts, character sizes, text alignment, colors, patterns and line styles.

The main title specifically describes the relationship shown in the graph. The second title gives the date the graph was created. The footnote contains the catalog name. Height two (H=2) is used to emphasize the main titles. The second title and footnote use height one hardware characters (the default). This
provides ample description of the graph while leaving most of the space for the graph itself. XSWISS font is used for the main title while the hardware font is used for the other text. Both titles and the footnote are left justified to help the user find this information easier. These characteristics of the titles and footnotes are specified in centralized macros, T1, T2, T3, and FOOT (see Appendix D).

The use of a consistent color scheme for all the bars, lines, or other shapes used in all the graphs gives the users an extra connection between the graph and the data. For example, having blue represent income and green represent expenses in a pie chart while blue represents expenses and green represents income in a line graph, causes confusion to the users. By always having the same class represented by the same color, extra reinforcement is provided. In most cases different patterns or line styles are also used to help reinforce these connections.

I setup two datasets (on other operating systems I would have had two directories). The first dataset contains the macros for viewing and creating the graphs. The other dataset contains the source code for creating the graphs.

BUILDING THE USER INTERFACE

I designed the chartbook system so that it could be invoked by an interactive command file (a TSO CLIST in my case). This command could be invoked automatically when the user logs on or explicitly by the user. I named my command CBOOK and the complete CLIST can be found in Appendix A. The CBOOK command invokes SAS and includes a file of source lines for initialization. The autoload macro library contains the macros to view any of the graphs. This library also contains several special purpose macros. The LOOP macro prompts the users for commands and invokes the appropriate macro. The CHARD and BWHARD macros cause any subsequent graphs to be sent to the color or black and white hardcopy device, respectively. The TERMINAL macro causes any subsequent graphs to be sent to the terminal. The HELP macro lists help messages to the terminal. The HELP and TERMINAL macros are automatically invoked once when the system is entered. The FS macro places the user in full screen PROC GREPLAY for selection of the graphs.

BUILDING THE GRAPHS

The whole set of graphs can be recreated all at once as shown in Appendix E. This job can be run at night to shift much of the processing associated with graphics to off-peak times.

PRODUCING THE CHART BOOK

Six graphs were placed on each page to reduce the amount of time required to find the desired graph. The chartbook is organized so that graphs showing different relations of a common variable are on the same page. On a page, the line plots, area plots, and 3-D plots are in the top row, while bar, pie, and block charts are in the second row. The chartbook pages were produced using a template and PROC GREPLAY. A seventh graph from PROC OSLIDE is also included on each page of the chartbook. This seventh graph includes the category title which is a general description of all the graphs on the page. The statements for building the chartbook can be found in Appendix B.

NEW FEATURES USED

Many new features are demonstrated in the example graphs found in Appendix C. The following is a brief list of the new features in each graph.

<table>
<thead>
<tr>
<th>Graph</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample1</td>
<td>PROC GPLOT PLOT2 Statement</td>
</tr>
<tr>
<td>Sample2</td>
<td>AXIS and LEGEND statements</td>
</tr>
<tr>
<td>Sample3</td>
<td>AXIS and LEGEND statements and bar size and spacing</td>
</tr>
<tr>
<td>Sample4</td>
<td>AXIS and LEGEND statements</td>
</tr>
<tr>
<td>Sample5</td>
<td>PROC G3D SCATTER statement</td>
</tr>
<tr>
<td>Sample6</td>
<td>LEGEND statement</td>
</tr>
<tr>
<td>Sample7</td>
<td>PROC GREPLAY templates</td>
</tr>
</tbody>
</table>

CONCLUSION

As the users gain experience with the system the should begin to request changes in the graphs or additions of new graphs. This is not a sign of failure; it is a sign of success. This design for an executive chartbook system is intended to be flexible enough to meet the demands for expansion.

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APPENDIX A

PROC DMS NOFS
ALLOC F(CB) DAF('data set with source code') SHR REUSE
SET OPTIONS+=STR(INCLUDE DQUOTE NONSOURCES NONOTES NONWNS)
IF STR(DEST) EQ THEN -
SET OPTIONS+=STR(NOUNITS OPTIONS!)
IF STR(DEST) NE THEN -
SET OPTIONS+=STR(NOUNITS OPTIONS!)
SAS OPTIONS!+=STR(\"NOC Chesetup\")
AUTOS (\"Data set with macros\")

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APPENDIX B

Building a Chartbook Page

APPENDIX C

NAME: Sample1
T I T L E: Stock Exchange Volume and Price

NAME: Sample2
T I T L E: Interest Rates (Prime and 6 month T-bills)

NAME: Sample3
T I T L E: Sources of Mortgages

NAME: Sample4
T I T L E: Farm Debt
Interest Rates
Last Updated 19MAR85

Sample 2

Mortgage Sources
Last Updated 19MAR85

Sample 3
Sample 4

Economic Indicators
Last Updated 19MAR85

Sample 5
Per Capita Income
Last updated 19MAR85

Per Capita Federal Aid
Last Updated 19MAR85

Sample 6

Sample 7