Macros to Create 3-Dimensional Plots and Charts with SAS/GRAPH® Software

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INTRODUCTION

The GCHART and GPLOT procedures in SAS/GRAPH software currently do not produce 3-dimensional bar charts, line plots, or area plots. We have developed a pair of SAS macros that can be used to produce these types of graphs with SAS/GRAPH software.

The VBAR3D macro (which produces 3-dimensional vertical bar charts) and the PLOT3D macro (which produces 3-dimensional line and area plots) both use the SAS/GRAPH Annotate facility to produce output. The user supplies all required information through a series of macro parameters, and the macros use Annotate functions to produce graphics.

Users have control over a number of parameters, including bar and line color, background color, fill patterns, axis and tickmark labels, bar and line spacing, and title and legend information. Sample graphs produced by the two macros are illustrated in Figures 1 and 2 below.

VBAR3D MACRO PARAMETER LIST

Below is a list of parameters that can be passed to the VBAR3D macro to specify variables and data sets to be used to produce the graph, and to control the appearance of the graph. The DS, MIDPOINT, RESPONSE, GROUP, VMAX, VMIN, and VINCR parameters are required; the rest of the parameters are optional. If optional parameters are not specified, the macro will use default values.

%MACRO VBAR3D(
  DS, /* data set name (REQUIRED) */
  MIDPOINT, /* midpoint variable (REQUIRED) */
  RESPONSE, /* response variable (REQUIRED) */
  GROUP, /* group variable (REQUIRED) */
  VMAX, /* vert axis max value (REQUIRED) */
  VMIN, /* vert axis min value (REQUIRED) */
  VINCR, /* by increment for vert axis (RED) */
  HEIGHT, /* height of graphics area, inches */
  LENGTH, /* length of all axes, (% of graph area) */
  BARWIDTH, /* width of vertical bars */
  FILL1, /* fill pattern for group 1 */
  FILL2, /* fill pattern for group 2 */
  FILL3, /* fill pattern for group 3 */
  FILL4, /* fill pattern for group 4 */
  CFILL1, /* fill color for group 1 */
  CFILL2, /* fill color for group 2 */
);

Figure 1: Graph Produced Using VBAR3D Macro

Figure 2: Graph Produced Using PLOT3D Macro
required; the rest of the parameters are optional. If used to produce the graph, and to control the appearance of the graph, the DS, X, and Y_A parameters are default values, optional parameters are not specified, the macro will use

%MACRO PLOT3D
DS, /* input data set (REQUIRED) */
X, /* horiz axis variable (REQUIRED) */
Y_A, /* first Y variable (REQUIRED) */
Y_B, /* second Y variable */
Y_C, /* third Y variable */
Z, /* BY variable */

XOFFSET, /* origin of axes in % of graph area in X direction */
YOFFSET, /* origin of axes in % of graph area in Y direction */
XPERMAX, /* maximum length of X axis in % of graph area */
YPERMAX, /* maximum length of Y axis in % of graph area */
XVALMIN, /* minimum value for X */
YVALMIN, /* minimum value for Y */
XVALMAX, /* maximum value for X */
YVALMAX, /* maximum value for Y */
XBYVAL, /* axis interval for X */
YBYVAL, /* axis interval for Y */
BARWIDTH, /* width of plot line-- % of graph area */
LNCOLOR1, /* color of 1st area under curve */
LNCOLOR2, /* color of 2nd area under curve */
LNCOLOR3, /* color of 3rd area under curve */
AREAPAT1, /* pattern of 1st area under curve */
AREAPAT2, /* pattern of 2nd area under curve */
AREAPAT3, /* pattern of 3rd area under curve */
TPCOLOR1, /* color of 1st plot line */
TPCOLOR2, /* color of 2nd plot line */
TPCOLOR3, /* color of 3rd plot line */
TOPAT1, /* pattern of 1st plot line */
TOPAT2, /* pattern of 2nd plot line */
TOPAT3, /* pattern of 3rd plot line */
TITLEONE, /* text of first title */
TITLETWO, /* text of second title */
LEGEND, /* display a legend? (yes/no) */
LEGLABEL, /* text of legend label */
LEGVAL1, /* first legend value */
LEGVAL2, /* second legend value */
LEGVAL3, /* third legend value */
VAXLABEL, /* vertical axis label */
HAXLABEL, /* horizontal axis label */
AREA, /* fill areas under the curves? (yes/no) */
GRIDLINE, /* grid line style (1-44) */
GRIDCOLOR, /* grid line color */
AREALCOLOR, /* color of lines in the area fill */
LEFTCOLOR, /* color of the left panel */
BACKCOLOR, /* color of the back panel */
BOTTOMCOLOR, /* color of the bottom panel */
LEFTFILL, /* pattern fill of the left panel */
BACKFILL, /* pattern fill of the back panel */
BOTTOMFILL, /* pattern fill of the bottom panel */
TITLECOLOR, /* title color */
AXISCOLOR, /* axis color */
LEGENDCOLOR, /* legend color */
TITLEFONT, /* title font */
AXISFONT, /* axis value font */
LEGENDFONT, /* legend font */
LEGHORIGIN, /* origin of legend in % of graph area in X direction */
LEGVORIGIN, /* origin of legend in % of graph area in Y direction */
XFORMAT, /* format for horizontal axis variable */
YFORMAT, /* format for vertical axis variable */
LIBREF, /* library reference */
CATALOG, /* catalog name */
ENTRY; /* graph entry name */

PLOT3D MACRO PARAMETER LIST

Below is a list of parameters that can be passed to the PLOT3D macro to specify variables and data sets to be used to produce the graph, and to control the appearance of the graph. The DS, X, and Y_A parameters are required; the rest of the parameters are optional. If optional parameters are not specified, the macro will use default values.
SAMPLE APPLICATIONS USING THE VBAR3D MACRO

The following program produces the 3-D bar chart shown in Figure 1 on the first page. This example illustrates the use of all the macro parameters to fully customize the chart.

data init;
  input @1 stooge $@10 pop2. @14 grp$;
cards;

Curly  20 West
CurlyJoe 10 West
Joe  10 West
Larry  40 West
Moe  10 West
Shemp  10 West
Curly  40 South
CurlyJoe 10 South
Joe  5 South
Larry  15 South
Moe  20 South
Shemp  10 South
Curly  30 North
CurlyJoe 5 North
Joe  10 North
Larry  20 North
Moe  20 North
Shemp  15 North
Curly  20 East
CurlyJoe 20 East
Larry  20 East
Moe  20 East
Shemp  20 East

%VBAR3D();
  /* data set name */
  DS=init,
  /* midpoint variable */
  MIDPOINT=stooge,
  /* response variable */
  RESPONSE=pop,
  /* group variable */
  GROUP=grp,
  /* vertical axis max value */
  VMAX=100,
  /* vertical axis min value */
  VMIN=0,
  /* by increment for vert axis */
  VINC=10,
  /* height of graphics area */
  HEIGHT=7,
  /* length of all axes */
  LENGTH=65,
  /* width of vertical bars */
  BARWIDTH=6,
  /* fill pattern for group 1 */
  FILL1=solid,
  /* fill pattern for group 2 */
  FILL2=solid,
  /* fill pattern for group 3 */
  FILL3=solid,
  /* fill pattern for group 4 */
  FILL4=solid,
  /* fill color for group 1 */
  CFILL1=gray3c,
  /* fill color for group 2 */
  CFILL2=gray9c,
  /* fill color for group 3 */
  CFILL3=gray50,
  /* fill color for group 4 */
  CFILL4=grayaa
  /* color of axes */
  CAXIS=gray3c,
  /* title for graph */
  TITLE=My Favorite Stooge,
  /* font used by title */
  FTITLE=swissb,
  /* color used by title */
  CTITLE=black,
  /* height of title text */
  HTITLE=2,
  /* midpoint axis label */
  MIDLABEL=STOOGES,
  /* response axis label */
  RESLABEL=PCT,
  /* group axis label */
  GRPLABEL=REGION,
  /* display group values */
  DSGRP=Y,
  /* display back grid values */
  DISRESBG=Y,
  /* color of midpoint axis label */
  CMIDLAL=black,
  /* color of response axis label */
  CRESLAB=black,
  /* color of group axis label */
  CGRPLAB=black,
  /* color for all tickmark values on all axes */
  CTICKVAL=black,
  /* legend label */
  LEGLABEL=LEGEND,
  /* font used by legend label */
  FLEGLAB=swissb,
  /* height of legend label */
  HLEGLAB=1.5,
  /* color of legend label */
  CLEGLAB=black,
  /* font for legend entries */
  FLEGENT=swissb,
  /* display the legend? */
  DISPLEG=Y,
  /* color of side grid */
  CSIDEGR=gray5c,
  /* color of back grid */
  CBACK=gray4c,
  /* background color for graphics area */
  CBACKSG=graydc,
  /* background color for side grid */
  CBACKBG=graydc,
  /* line style for side grid */
  LINESG=2,
  /* line style for back grid */
  LINEBG=2,
  /* grid line thickness */
  SIZESG=2,
  /* grid line thickness */
  SIZEBG=2,
  /* display the bottom grid? */
  DISPBTG=Y,
  /* font used by axis labels */
  FAXVAL=swissb,
  /* height of axis values */
  HAXVAL=1.5,
  /* angle of midpoint axis values */
  AMIDVAL=45,
  /* font used by labels */
  FAXLAB=swissb,
  /* height of labels */
  HAXLAB=1.5,
  /* horizontal offset from lower-left corner in percent */
  HORIZONTAL=30,
  /* vertical offset from lower-left corner in percent */
  VORIGIN=20,
  /* space between the bars */
  HSPACE=1.5,
  /* label for output catalog */
  LIBREF=work,
  /* output catalog name */
  ENTRY=stooge3d;

The next program produces the output in Figure 3. This program uses the minimum number of parameters required by the VBAR3D macro; the graph is generated using default values for the remainder of the parameters.

data init;
  input @1 stooge $@10 pop2. @14 grp$;
cards;

Curly  10 Single Women
CurlyJoe 5 Single Women
Joe   10 Single Women
Larry  60 Single Women
Moe   5 Single Women
Shemp 10 Single Women

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SAMPLE APPLICATIONS USING THE PLOT3D MACRO

The following program produces the 3-D plot shown in Figure 2 on the first page. This example illustrates use of all the macro parameters to fully customize the chart.

```
data a;
  input year 1-6 coastal 8-9 piedmont 11-12 mountain 14-15 z 17-19;
cards;
  1985 1530401
  1986 1837491
  1987 2022311
  1988 2130351
  1989 2439431
  1990 3644511
  1991 2032471
  1992 1528321
  1993 2833451
  1994 3539501
  1995 3335451
run;

%PLOT3D(
  ds=a,
  x=year,
  y=coastal p piedmont, y=mountain, z=z,
  xoff=17, yoff=28, xpermx=50, ypermx=40,
  xvalmin=1985, yvalmin=0, xvalmax=1995, yvalmax=60,
  xbyval=1, ybyval=10,
  barwidth=2,
  fillcolor1=gray99, fillcolor2=grayaa, fillcolor3=gray77,
  areapat1=solid, areapat2=solid, areapat3=solid,
  title=Annual Precipitation, /*
  text of first title */
);```

Figure 3: Graph Produced Using the VBAR3D Macro With Minimum Parameters

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The next program produces the output in Figure 4. This program uses relatively few parameters; the graph is generated using default values for the remainder of the parameters.

```sas
data a;
  input year 1-6 coastal 8-9 piedmont 11-12 mountain 14-15;
cards;
1985 15 30 40
1986 18 37 49
1987 20 22 37
1988 21 30 35
1989 24 39 43
1990 36 44 51
1991 20 32 47
1992 12 28 32
1993 28 33 45
1994 35 39 50
1995 33 35 45
run;
```

%PLOT3D(
dsa=a, / input data set
  xaxis=year, / haxis variable
  y_ a=coastal, / first y variable
  y_b=piedmont, / second y variable
  y_c=mountain / third y variable
);
• You can obtain the macros from the Institute's World Wide Web site. To use this method, connect to HTTP://WWW.SAS.COM. From the main menu, select Support Services, then Technical Support, then SAS Institute Bulletin Board System. From this screen, you can select FTP Server to download the files.

• If you are unable to obtain the macros through the above methods, contact our Technical Support Division at (919) 677-8008.

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