Something for Nothing!
Converting Plots from SAS/GRAPH®
to ODS Graphics

Philip R Holland
Holland Numerics Ltd, UK
Agenda

- Introduction
- Scatter Plots, Line Plots and Error Bars
- Regression Plots
- Box Plots
- Vertical and Horizontal Bar Charts
- Pie Charts
- Conclusions
Introduction

A comparison of the output from the most commonly used SAS code for producing plots and charts using SAS/GRAPH and ODS Graphics:

- **Easy:** Replacing one SAS/GRAPH procedure statement with an ODS Graphics procedure. The conversion may also require some pre-processing of the input data.

- **Difficult:** Replacing one SAS/GRAPH procedure with code containing PROC TEMPLATE and PROC SGRENDER, or the conversion requires extensive pre-processing of the input data.

- **Impossible:** There is currently no corresponding ODS Graphics procedure in that version of SAS software to replicate the SAS/GRAPH graph.
Scatter Plots (Easy)

SAS 9.2: PROC GPLOT

SAS 9.2M3: PROC SGPLOT
Scatter Plots (Easy)

```
PROC SGPlot DATA = sashelp.class;
   SCATTER Y = weight X = height / GROUP = sex;
RUN;
```
Line Plots (Easy)

SAS 9.2: PROC GPLOT

SAS 9.2M3: PROC SGPLOT
Line Plots (Easy)

PROC SORT DATA = sashelp.class OUT = class;
   BY sex height;
RUN;

PROC SGPLOT DATA = class;
   SERIES Y = weight X = height / GROUP = sex MARKERS MARKERATTRS =(SYMBOL=CIRCLE);
RUN;
Line Plots with Error Bars (Easy)

SAS 9.2: PROC GPLOT

SAS 9.2M3: PROC SGPLOT
**Line Plots with Error Bars (Easy)**

```sas
PROC SORT DATA = sashelp.class OUT = class;
  BY sex height;
RUN;

PROC SUMMARY DATA = class NWAY;
  CLASS sex;
  VAR weight;
  OUTPUT OUT = class_se STDERR = weight_se;
RUN;

DATA class_ods (KEEP = sex height value value_upper value_lower);
  MERGE class class_se; BY sex;
  value = weight;
  value_upper = weight + weight_se;
  value_lower = weight - weight_se;
  OUTPUT;
RUN;

PROC SGPLOT DATA = class_ods;
  SCATTER Y = value X = height /
    GROUP = sex
    YERRORUPPER = value_upper
    YERRORLOWER = value_lower;
  SERIES Y = value X = height / GROUP = sex;
  LABEL value = "Weight";
RUN;
```
Regression Plots (Easy)

SAS 9.2: PROC GPLOT

SAS 9.2M3: PROC SGPLOT
Regression Plots (Easy)

```
PROC SORT DATA = sashelp.class OUT = class;
   BY sex height;
RUN;

PROC SGPLOT DATA = class;
   REG Y = weight X = height / GROUP = sex CLI MarkerATTRS = (SYMBOL=CIRCLE);
RUN;
```
Box Plots (Easy)

SAS 9.2: PROC GPLOT

SAS 9.2M3: PROC SGPLOT
Box Plots (Easy)

PROC SORT DATA = sashelp.class OUT = class;
    BY age;
RUN;

PROC SGPLOT DATA = class;
   VBOX height / CATEGORY = age;
RUN;
Vertical Bar Charts (Easy)

SAS 9.2: PROC GCHART

SAS 9.2M3: PROC SGPLOT
PROC SORT DATA = sashelp.class OUT = class;
   BY sex age;
RUN;

PROC SGPLOT DATA = class;
   VBAR age;
RUN;
Vertical Bar Charts (Easy)

SAS 9.2: PROC GCHART

SAS 9.2M3: PROC SGPLOT
Vertical Bar Charts (Easy)

PROC SORT DATA = sashelp.class OUT = class;
  BY sex age;
RUN;

PROC SGPLOT DATA = class;
  VBAR age / GROUP = sex;
RUN;
Vertical Bar Charts (Easy)

SAS 9.2: PROC GCHART

SAS 9.2M3: PROC SGPANEL
Vertical Bar Charts (Easy)

PROC SORT DATA = sashelp.class OUT = class;
  BY sex age;
RUN;

PROC SGPANEL DATA = class;
  PANELBY age / COLUMNS = 6;
  VBAR sex / GROUP = sex;
RUN;
Vertical Bar Charts (Easy)

SAS 9.2: PROC GCHART

SAS 9.3M1: PROC SGPLOT
Vertical Bar Charts (Easy)

PROC SORT DATA = sashelp.class OUT = class;
  BY sex age;
RUN;

PROC SGPLOT DATA = class;
  VBAR age / GROUP = sex GROUPDISPLAY = CLUSTER;
RUN;
Horizontal Bar Charts (Easy)

SAS 9.2: PROC GCHART

<table>
<thead>
<tr>
<th>Age</th>
<th>CUM FREQ</th>
<th>FREQ</th>
<th>PCT.</th>
<th>CUM PCT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2</td>
<td>2</td>
<td>10.53</td>
<td>10.53</td>
</tr>
<tr>
<td>12</td>
<td>7</td>
<td>5</td>
<td>22.32</td>
<td>32.84</td>
</tr>
<tr>
<td>13</td>
<td>10</td>
<td>3</td>
<td>15.79</td>
<td>48.63</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>4</td>
<td>21.05</td>
<td>69.68</td>
</tr>
<tr>
<td>15</td>
<td>18</td>
<td>4</td>
<td>21.05</td>
<td>90.74</td>
</tr>
<tr>
<td>16</td>
<td>19</td>
<td>1</td>
<td>5.26</td>
<td>100.00</td>
</tr>
</tbody>
</table>

SAS 9.2M3: PROC SGPLOT

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
</tr>
</tbody>
</table>

HOLLAND NUMERICS LIMITED
Horizontal Bar Charts (Easy)

PROC SORT DATA = sashelp.class OUT = class;
   BY sex age;
RUN;

PROC SGPLOT DATA = class;
   HBAR age;
RUN;
Horizontal Bar Charts (Difficult)

SAS 9.2: PROC GCHART

SAS 9.4M1: PROC SGPLOT

<table>
<thead>
<tr>
<th>Age</th>
<th>FREQ</th>
<th>FREQ</th>
<th>PCT</th>
<th>PCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2</td>
<td>2</td>
<td>10.53</td>
<td>10.53</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>7</td>
<td>26.32</td>
<td>30.84</td>
</tr>
<tr>
<td>13</td>
<td>3</td>
<td>10</td>
<td>15.79</td>
<td>52.63</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td>14</td>
<td>21.05</td>
<td>73.68</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td>18</td>
<td>21.05</td>
<td>94.74</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>19</td>
<td>5.26</td>
<td>100.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frq</th>
<th>Cfrq</th>
<th>Pct</th>
<th>Opct</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>10.53</td>
<td>10.53</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>26.32</td>
<td>30.84</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>15.79</td>
<td>52.63</td>
</tr>
<tr>
<td>4</td>
<td>14</td>
<td>21.05</td>
<td>73.68</td>
</tr>
<tr>
<td>4</td>
<td>18</td>
<td>21.05</td>
<td>94.74</td>
</tr>
<tr>
<td>1</td>
<td>19</td>
<td>5.26</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Horizontal Bar Charts (Difficult)

PROC SORT DATA = sashelp.class OUT = class;
   BY age;
RUN;

PROC FREQ DATA = class;
   TABLES age / OUT = class_summ NOPRINT;
RUN;

DATA class_summ;
   SET class_summ;
   RETAIN cum_freq cum_pct .;
   freq = count;
   cum_freq + count;
   cum_pct + percent;
   FORMAT freq cum_freq 6. percent cum_pct 6.2;
RUN;
Horizontal Bar Charts (Difficult)

```
PROC SGPLOT DATA = class_summ;
   HBAR age / STAT = FREQ;
       YAXISTABLE freq cum_freq percent cum_pct /
           LOCATION = INSIDE POSITION = RIGHT LABELPOS = TOP;
RUN;
```
Horizontal Bar Charts (Easy)

**SAS 9.2: PROC GCHART**

<table>
<thead>
<tr>
<th>Age</th>
<th>FREQ</th>
<th>CUM. FREQ.</th>
<th>PCT.</th>
<th>CUM. PCT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0.03</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>2</td>
<td>10.3</td>
<td>10.3</td>
</tr>
<tr>
<td>13</td>
<td>3</td>
<td>7</td>
<td>36.8</td>
<td>36.8</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td>10</td>
<td>52.6</td>
<td>52.6</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td>14</td>
<td>73.6</td>
<td>73.6</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>19</td>
<td>94.7</td>
<td>94.7</td>
</tr>
</tbody>
</table>

**SAS 9.2M3: PROC SGPLOT**

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Sex</th>
<th>F</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Horizontal Bar Charts**

- **SAS 9.2: PROC GCHART**
- **SAS 9.2M3: PROC SGPLOT**

*HOLLAND NUMERICS LIMITED*
Horizontal Bar Charts (Easy)

PROC SORT DATA = sashelp.class OUT = class;
   BY sex age;
RUN;

PROC SGPLOT DATA = class;
   HBAR age / GROUP = sex;
RUN;
Horizontal Bar Charts (Difficult)

SAS 9.2: PROC GCHART

SAS 9.4M1: PROC SGPLOT
Horizontal Bar Charts (Difficult)

PROC SORT DATA = sashelp.class OUT = class;
   BY sex age;
RUN;

PROC FREQ DATA = class;
   TABLES sex * age / OUT = class_stack_summ NOPRINT;
RUN;
Horizontal Bar Charts (Difficult)

DATA class_stack_summ;
  SET class_stack_summ;
  BY sex age;
  RETAIN cum_freq cum_pct .;
  freq = count;
  cum_freq + count;
  cum_pct + percent;
  FORMAT freq cum_freq 3. percent cum_pct 6.2;
RUN;

DATA class_stack_summ;
  SET class_stack_summ;
  BY sex age;
  IF NOT LAST.age THEN DO;
    freq = .;
    cum_freq = .;
    percent = .;
    cum_pct = .;
  END;
RUN;
Horizontal Bar Charts (Difficult)

PROC SGPLOT DATA = class_stack_summ;
   HBAR age / GROUP = sex;
   YAXISTABLE freq cum_freq percent cum_pct /
       LOCATION = INSIDE POSITION = RIGHT LABELPOS = TOP;
RUN;
Horizontal Bar Charts (Easy)

SAS 9.2: PROC GCHART

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Freq.</th>
<th>CUM. FREQ.</th>
<th>PCT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>F</td>
<td>1</td>
<td>1</td>
<td>5.26</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>2</td>
<td>5.26</td>
</tr>
<tr>
<td>12</td>
<td>F</td>
<td>2</td>
<td>4</td>
<td>10.53</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>3</td>
<td>7</td>
<td>15.79</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>2</td>
<td>9</td>
<td>21.05</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>10</td>
<td>26.31</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>2</td>
<td>12</td>
<td>31.62</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>2</td>
<td>14</td>
<td>38.89</td>
</tr>
<tr>
<td>15</td>
<td>F</td>
<td>2</td>
<td>16</td>
<td>44.21</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>2</td>
<td>18</td>
<td>51.74</td>
</tr>
<tr>
<td>16</td>
<td>F</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>2</td>
<td>5.26</td>
</tr>
</tbody>
</table>

SAS 9.2M3: PROC SG PANEL

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Freq.</th>
<th>CUM. FREQ.</th>
<th>PCT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>F</td>
<td>1</td>
<td>1</td>
<td>5.26</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>2</td>
<td>5.26</td>
</tr>
<tr>
<td>12</td>
<td>F</td>
<td>2</td>
<td>4</td>
<td>10.53</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>3</td>
<td>7</td>
<td>15.79</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>2</td>
<td>9</td>
<td>21.05</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>10</td>
<td>26.31</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>2</td>
<td>12</td>
<td>31.62</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>2</td>
<td>14</td>
<td>38.89</td>
</tr>
<tr>
<td>15</td>
<td>F</td>
<td>2</td>
<td>16</td>
<td>44.21</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>2</td>
<td>18</td>
<td>51.74</td>
</tr>
<tr>
<td>16</td>
<td>F</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>2</td>
<td>5.26</td>
</tr>
</tbody>
</table>
Horizontal Bar Charts (Easy)

PROC SORT DATA = sashelp.class OUT = class;
   BY sex age;
RUN;

PROC SGPANEL DATA = class;
   PANELBY age / ROWS = 6;
   HBAR sex / GROUP = sex;
RUN;
Horizontal Bar Charts (Easy)

SAS 9.2: PROC GCHART

SAS 9.3M1: PROC SGPLOT

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>FREQ</th>
<th>FREQ</th>
<th>CUM.</th>
<th>CUM.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>F</td>
<td>1</td>
<td>1</td>
<td>5.26</td>
<td>5.26</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>2</td>
<td>5.26</td>
<td>10.53</td>
</tr>
<tr>
<td>12</td>
<td>F</td>
<td>2</td>
<td>4</td>
<td>10.53</td>
<td>21.05</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>3</td>
<td>7</td>
<td>15.79</td>
<td>36.84</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>2</td>
<td>9</td>
<td>10.53</td>
<td>47.37</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>10</td>
<td>5.26</td>
<td>52.63</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>2</td>
<td>12</td>
<td>10.53</td>
<td>63.16</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>2</td>
<td>14</td>
<td>10.53</td>
<td>73.68</td>
</tr>
<tr>
<td>15</td>
<td>F</td>
<td>2</td>
<td>16</td>
<td>10.53</td>
<td>84.21</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>2</td>
<td>18</td>
<td>10.53</td>
<td>94.74</td>
</tr>
<tr>
<td>16</td>
<td>F</td>
<td>0</td>
<td>18</td>
<td>0.00</td>
<td>94.74</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>19</td>
<td>5.26</td>
<td>100.00</td>
</tr>
</tbody>
</table>

---

HOLLAND NUMERICS LIMITED
Horizontal Bar Charts (Easy)

PROC SORT DATA = sashelp.class OUT = class;
    BY sex age;
RUN;

PROC SGPLOT DATA = class;
   HBAR age / GROUP = sex GROUPDISPLAY = CLUSTER;
RUN;
Horizontal Bar Charts (Impossible)

SAS 9.2: PROC GCHART

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>FREQ FREQ</th>
<th>CUM. FREQ</th>
<th>CUM. PCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>F</td>
<td>1</td>
<td>1</td>
<td>5.26</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>2</td>
<td>5.26</td>
</tr>
<tr>
<td>12</td>
<td>F</td>
<td>2</td>
<td>4</td>
<td>10.53</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>3</td>
<td>7</td>
<td>15.79</td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>2</td>
<td>9</td>
<td>10.53</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>10</td>
<td>5.26</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>2</td>
<td>12</td>
<td>10.53</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>2</td>
<td>14</td>
<td>10.53</td>
</tr>
<tr>
<td>15</td>
<td>F</td>
<td>2</td>
<td>16</td>
<td>10.53</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>2</td>
<td>18</td>
<td>10.53</td>
</tr>
<tr>
<td>16</td>
<td>F</td>
<td>0</td>
<td>18</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1</td>
<td>19</td>
<td>5.26</td>
</tr>
</tbody>
</table>

Not possible before SAS 9.4 Maintenance 2
Pie Charts (Difficult)

SAS 9.2: PROC GCHART

SAS 9.3M1: PROC TEMPLATE
Pie Charts (Difficult)

PROC SORT DATA = sashelp.class OUT = class;
   BY age;
RUN;

PROC TEMPLATE;
   DEFINE STATGRAPH pie;
   BEGINGRAPH;
      LAYOUT REGION;
         PIECHART CATEGORY = age / DATALABELLOCATION = OUTSIDE
                     CATEGORYDIRECTION = CLOCKWISE START = 180 NAME = 'pie';
                     DISCRETELEGEND 'pie' / TITLE = 'Age';
      ENDLAYOUT;
   ENDGRAPH;
END;
RUN;

PROC SGRENDER DATA = class TEMPLATE = pie;
RUN;
This chart is one that I have never really liked. My opinion of this graph is that, rather than being a way to inform the viewer, they are frequently used to mislead the viewer instead.

It is with great delight that I have discovered that 3D pie charts will not be supported in any release of ODS Graphics in the near future.

This does not prevent SAS users who wish to create these charts from doing so, but they will be required to license SAS/GRAPH first.
Conclusions

- Do you only create plots, and no charts at all? This probably means that your programs could be converted from SAS/GRAPH to ODS Graphics in SAS 9.2 or 9.3.

- If you create bar charts, do you draw horizontal bar charts that require large amounts of text added alongside the chart? It should still be possible to convert your programs from SAS/GRAPH to ODS Graphics in SAS 9.2 or 9.3.

- If you require horizontal clustered bar charts with large amounts of text added, 2D or 3D pie charts, then keep your SAS/GRAPH licence for now, as PROC GCHART is not going away in the foreseeable future!
Contact Details

Name: Philip R Holland
Organization: Holland Numerics Limited
Address: 94 Green Drift, Royston, Hertfordshire, SG8 5BT, UK
Work Phone: +44-7714-279085
Email: phil@hollandnumerics.com
Web: www.hollandnumerics.com/SASPAPER.HTM