Auto Charts - Hidden gem in SAS® ODS Graphics Designer

Max Cherny
Monday, 11 March 2019
Agenda

– Overview of Auto Charts
– Using Auto Charts
  – Example 1
  – Example 2
– Q&A
Overview of Auto Charts

– Automatically creates many possible figures based on variables in a dataset
– Code behind each figure can be reviewed and modified further as needed
– Ideal for experimentation, quick generation of graphs and learning ODS graphics
– Easy to use
– No prior experience with graphics or ODS is needed
Example 1: Scatter plot

Input dataset contains baseline heart rate and weight per subject:

<table>
<thead>
<tr>
<th>Subject (Subject)</th>
<th>Treatment (Treatment)</th>
<th>Heart Rate (HeartRate)</th>
<th>Weight (Weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>79</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>60</td>
<td>91</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>100</td>
<td>67</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>65</td>
<td>77</td>
</tr>
<tr>
<td>5</td>
<td>B</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>6</td>
<td>A</td>
<td>102</td>
<td>71</td>
</tr>
<tr>
<td>7</td>
<td>B</td>
<td>65</td>
<td>86</td>
</tr>
<tr>
<td>8</td>
<td>B</td>
<td>87</td>
<td>75</td>
</tr>
<tr>
<td>9</td>
<td>B</td>
<td>98</td>
<td>90</td>
</tr>
<tr>
<td>10</td>
<td>A</td>
<td>101</td>
<td>78</td>
</tr>
</tbody>
</table>
### Auto Charts

**Library:** TEST

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBJECT</td>
<td>Continuo</td>
<td>1 - 10</td>
</tr>
<tr>
<td>TREATMENT</td>
<td>Discrete</td>
<td>2</td>
</tr>
<tr>
<td>HEART RATE</td>
<td>Continuo</td>
<td>60 - 102</td>
</tr>
<tr>
<td>WEIGHT</td>
<td>Continuo</td>
<td>67 - 91</td>
</tr>
</tbody>
</table>

**Data Set:** VITALSIGNS (10 observations)

**Select graph types:**
- Univariate
- Bivariate

---

27 graphs (0 new)
### Auto Charts

**Library:** TEST  
**Data Set:** VITALSIGNS  
(10 observations)

<table>
<thead>
<tr>
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<th>Type</th>
<th>Details</th>
</tr>
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<tbody>
<tr>
<td>SUBJECT</td>
<td>Continuous</td>
<td>1 - 10</td>
</tr>
<tr>
<td>TREATMENT</td>
<td>Discrete</td>
<td>2</td>
</tr>
<tr>
<td>HEARTRATE</td>
<td>Continuous</td>
<td>60 - 102</td>
</tr>
<tr>
<td>WEIGHT</td>
<td>Continuous</td>
<td>67 - 91</td>
</tr>
</tbody>
</table>

Select graph types:
- Univariate
- Bivariate
- Grouped
- Advanced Plots

[Generate Graphs]
Graph Creation Error

WARNING: Confidence and/or prediction limits could not be computed for one or more groups.
WARNING: The modelband statement named 'modelband' will not be drawn because one or more of the required arguments were not supplied.
WARNING: The modelband statement named 'modelband2' will not be drawn because one or more of the required arguments were not supplied.
The current change will be discarded.

Select graph types:
- Univariate
- Bivariate
- Grouped
- Advanced Plots

Generate Graphs
### Auto Charts

**Library:** TEST  
**Data Set:** VITALSIGNS (10 observations)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Details</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBJECT</td>
<td>1 - 10</td>
<td>Continuous</td>
</tr>
<tr>
<td>TREATMENT</td>
<td>2</td>
<td>Discrete</td>
</tr>
<tr>
<td>HEARTRATE</td>
<td>60 - 102</td>
<td>Continuous</td>
</tr>
<tr>
<td>WEIGHT</td>
<td>67 - 91</td>
<td>Continuous</td>
</tr>
</tbody>
</table>

**Select graph types:**
- Univariate
- Bivariate
- Grouped
- Advanced Plots

**Graphs:**
- HEARTRATE by TREATMENT
- WEIGHT by TREATMENT
- HEARTRATE by SUBJECT
- WEIGHT by SUBJECT
- WEIGHT by HEARTRATE
- Frequency plot for TREATMENT

**Buttons:**
- Open
- Save As
- Delete
- Delete All

**32 graphs (32 new)**
WEIGHT by HEART RATE and TREATMENT

- Heart Rate on the x-axis
- Weight on the y-axis

Legend:
- A (blue circles)
- B (red pluses)
WEIGHT by HEARTRATE and TREATMENT
proc template;
define statgraph sgdesign;
dynamic _HEARTRATE _WEIGHT _TREATMENT;
begingraph;
  entrytitle halign=center 'WEIGHT by HEARTRATE and TREATMENT';
  layout lattice / rowdatarange=data columndatarange=data rowgutter=10 columngutter=10;
  layout overlay / xaxisopts=( display=(TICKS TICKVALUES LINE LABEL ) label=('Heart Rate (bpm)')) discreteopts=
    (tickvaluelimitpolicy=splittroate) yaxisopts=( display=(TICKS TICKVALUES LINE LABEL ) label=('Weight (kg)')) discreteopts=
    (tickvaluelimitpolicy=none));
  scatterplot x=_HEARTRATE y=_WEIGHT / group=_TREATMENT name='scatter';
  discretelegend 'scatter' / opaque=false border=true halign=right valign=top displayclipped=true across=1
  location=inside;
  endlayout;
  endlayout;
endgraph;
end;
run;

proc sgrender data=TEST.VITALSIGNS template=sgdesign;
dynamic _HEARTRATE="HEARTRATE" _WEIGHT="WEIGHT" _TREATMENT="TREATMENT";
run;
proc template;
define statgraph sgdesign;
dynamic _HEARTRATE _WEIGHT _TREATMENT;
begingraph;

   entrytitle halign=center 'WEIGHT by HEARTRATE and TREATMENT';
   layout lattice / rowdatarange=data columnndatarange=data rowgutter=10 columngutter=10;
   layout overlay / xaxisopts=(display=(TICKS TICKVALUES LINE LABEL ) label=('Heart Rate (bpm)')) discreteopts=
   (tickvaluefitpolicy=splitrotate) yaxisopts=(display=(TICKS TICKVALUES LINE LABEL ) label=('Weight (kg)')) discrete=
   (tickvaluefitpolicy=none));

   scatterplot x=_HEARTRATE y=_WEIGHT / group=_TREATMENT name='scatter';
discretelegend 'scatter' / opaque=false border=true halign=right valign=top displayclipped=true across=1 location=inside;
endlayout;
endlayout;
endgraph;
end;
run;

proc sgrender data=TEST.VITALSIGNS template=sgdesign;
dynamic _HEARTRATE="HEARTRATE" _WEIGHT="WEIGHT" _TREATMENT="TREATMENT";
run;
PROC TEMPLATE;
DEFINE STATGRAPH SGDESIGN;
DYNAMIC _HEARTRATE _WEIGHT _TREATMENT;
BEGINGRAPH;
ENTRYTITLE HALIGN=CENT 'WEIGHT BY HEARTRATE AND TREATMENT';
LAYOUT LATTICE / ROWDATARANGE=DATA COLUMNDATARANGE=DATA ROWGUTTER=10 COLUMNGUTTER=10;
LAYOUT OVERLAY / XAXISOPTS=( DISPLAY=(TICKS TICKVALUES LINE LABEL ) LABEL=( 'Heart Rate (bpm)' ) DISCRETEOPTS=( TICKVALUEFITPOLICY=SPILL ));
SCATTERPLOT X=HEARTRATE Y=WEIGHT / GROUP=TREATMENT NAME='SCATTER';
DISCRETELEGEND 'SCATTER' / OPAQUE=FALSE BORDER=TRUE HALIGN=RIGHT VALIGN=TOP DISPLAYCLIPPED=TRUE ACROSS=1 ORDER=ROWMAJOR LOCATION=IN;
ENDLAYOUT;
ENDGRAPH;
PROC SGRENDER DATA=TEST.VITALSIGNS TEMPLATE=SGDESIGN;
DYNAMIC _HEARTRATE="HEARTRATE" _WEIGHT="WEIGHT" _TREATMENT="TREATMENT";
RUN;
RUN;
Example 2: Vertical bar chart

Required graph:
Example 2: Vertical bar chart

Input dataset contains heart rate per subject per visit:

<table>
<thead>
<tr>
<th>Subject (Subject)</th>
<th>Visit (Visit)</th>
<th>HeartRate (HeartRate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subj.1</td>
<td>1</td>
<td>90</td>
</tr>
<tr>
<td>Subj.1</td>
<td>2</td>
<td>93</td>
</tr>
<tr>
<td>Subj.1</td>
<td>3</td>
<td>95</td>
</tr>
<tr>
<td>Subj.2</td>
<td>1</td>
<td>77</td>
</tr>
<tr>
<td>Subj.2</td>
<td>2</td>
<td>70</td>
</tr>
<tr>
<td>Subj.2</td>
<td>3</td>
<td>81</td>
</tr>
<tr>
<td>Subj.3</td>
<td>1</td>
<td>61</td>
</tr>
<tr>
<td>Subj.3</td>
<td>2</td>
<td>63</td>
</tr>
<tr>
<td>Subj.3</td>
<td>3</td>
<td>65</td>
</tr>
<tr>
<td>Subj.4</td>
<td>1</td>
<td>96</td>
</tr>
<tr>
<td>Subj.4</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Subj.4</td>
<td>3</td>
<td>105</td>
</tr>
</tbody>
</table>
## Auto Charts

**Library:** TEST  
**Data Set:** HEART_RATE_BY_VISIT (12 observations)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Details</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBJ</td>
<td>4</td>
<td>Discrete</td>
</tr>
<tr>
<td>VISIT</td>
<td>3</td>
<td>Discrete</td>
</tr>
<tr>
<td>HEART</td>
<td>61 - 105</td>
<td>Continuous</td>
</tr>
</tbody>
</table>

Select graph types:  
- Univariate  
- Bivariate  
- Grouped  
- Advanced Plots

[Generate Graphs]
Generating graphs (2 of 23)

Panel of HEART RATE DISTRIBUTION by VISIT

Select graph types:
- Univariate
- Bivariate
- Grouped
- Advanced Plots

Generate Graphs

(12 observations)
HEART RATE by VISIT and SUBJECT

Heart Rate

Subj.1  Subj.2  Subj.3  Subj.4
HEART RATE by VISIT and SUBJECT

Graph showing heart rate by visit and subject.
Legend Properties

Legend Title:

Title Text Appearance
Style Element: GraphLabelText
Color: Auto
Font Family: Auto: Albany AMT
Font Size: Auto: 10
Font Style: Auto: Regular

Background Appearance
Fill:
Outline:
Position: Bottom

Legend Size
Layout: Automatic

HeartRate
Subj.1, Subj.2, Subj.3, Subj.4.
HEARTRATE by VISIT and SUBJECT

Subjects: Subj1, Subj2, Subj3, Subj4
HEARTRATE by VISIT and SUBJECT
HEARTRATE by VISIT and SUBJECT

HeartRate

Subjects  Subj.1  Subj.2  Subj.3  Subj.4
proc template;
define statgraph sgdesign;
dynamic _VISIT _HEARTRATE _SUBJECT;
begingraph / dataskin=CRISP;	enentrytitle halign=center 'HEARTRATE by VISIT and SUBJECT';
layout lattice / rowdatarange=data columndatarange=data rowgutter=10 columngutter=10;
layout overlay / xaxisopts=(display=(TICKS TICKVALUES LINE LABEL) discreteopts=(
tickvaluefitpolicy=splitrotatet)) yaxisopts=(display=(TICKS TICKVALUES LINE LABEL) discreteopts=(
tickvaluefitpolicy=none));
   barchart category=_VISIT response=_HEARTRATE / group=_SUBJECT name='bar(h)' stat=mean
               orient=horizontal groupdisplay=Cluster;
               endlayout;
   sidebar / align=bottom spacefill=false;
               discretelegend 'bar(h)' / opaque=true border=true halign=center valign=center title='Subjects'
               displayclipped=true order=rowmajor;
               endsidebar;
               endlayout;
               endgraph;
               end;
run;

proc sgrender data=TEST.HEARTRATEBYVISIT template=sgdesign;
dynamic _VISIT="VISIT" _HEARTRATE="HEARTRATE" _SUBJECT="SUBJECT";
run;
proc template;
  define statgraph sgdesign;
  dynamic _VISIT _HEARTRATE _SUBJECT;
  begingraph / dataskin=CRISP;
    entrytitle halign=center 'HEARTRATE by VISIT and SUBJECT';
    layout lattice / rowdatarange=data columndatarange=data rowgutter=10 columngutter=10;
    layout overlay / xaxisopts=( display=(TICKS TICKVALUES LINE LABEL ) discreteopts=(
      tickvaluefitpolicy=splitrotate) yaxisopts=( display=(TICKS TICKVALUES LINE LABEL )
      discreteopts=( tickvaluefitpolicy=none));
    barchart category=_VISIT response=_HEARTRATE / group=_SUBJECT name='bar(h)'
      stat=mean orient=horizontal groupdisplay=Cluster;
    endlayout;
    sidebar / align=bottom spacefill=false;
      discretelegend 'bar(h)' / opaque=true border=true halign=center valign=center
      title='Subjects' displayclipped=true order=rowmajor;
    endsidebar;
  endgraph;
end;
run;

proc sgrender data=TEST.HEARTRATEBYVISIT template=sgdesign;
  dynamic _VISIT="VISIT" _HEARTRATE="HEARTRATE" _SUBJECT="SUBJECT";
run;
proc template;
define statgraph sgdesign;
dynamic _VISIT _HEARTRATE _SUBJECT;
begingraph / dataskin=CRISP;
  entrytitle halign=center 'HEARTRATE by VISIT and SUBJECT';
  layout lattice / rowdatarange=data columndata=range=data rowgutter=10 columngutter=10;
  layout overlay / xaxisopts=( display=(TICKS TICKVALUES LINE LABEL ) discreteopts=(
tickvaluefitpolicy=splitrotate)) yaxisopts=( display=(TICKS TICKVALUES LINE LABEL )
discreteopts=( tickvaluefitpolicy=none));
  barchart category=_VISIT response=_HEARTRATE / group=_SUBJECT name='bar(h)'
stat=mean orient=vertical groupdisplay=Cluster;
  endlayout;
  sidebar / align=bottom spacefill=false;
    discretelegend 'bar(h)' / opaque=true border=true halign=center valign=center
title='Subjects' displayclipped=true order=rowmajor;
 endsidebar;
  endlayout;
endgraph;
end;
run;

proc sgrender data=TEST.HEARTRATEBYVISIT template=sgdesign;
dynamic _VISIT="VISIT" _HEARTRATE="HEARTRATE" _SUBJECT="SUBJECT";
run;
Conclusion

– Excellent tool for SAS users at any experience level to generate various graphs for data exploration or learning ODS/GTL

– Automatic generation of all possible combinations of graphs is the main advantage over other similar SAS products (e.g. Enterprise Guide, SAS Studio, SAS ODS designer, Graph-N-G and SAS Assist)
Questions?