ODS Graphics Designer in SAS® 9.3

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Outline

- Overview of ODS Graphics
  - History of SAS Graphics
  - Features of SAS Graphics
  - Anatomy of ODS Statistical Graphics
- Creating Graphics – Demonstration
  - Basic Features / Interface
  - Graphics Output from the FREQ procedure
  - Graphics Output from the UNIVARIATE procedure
- Quick Look at Graphics Template Language

History of SAS Graphics

- SAS has an inferior reputation for graphical output
- Multiple graphics techniques in SAS including:
  - proc plot – basic graphics
  - SAS / Graph – vector graphics with quality output
    - Too many options to learn well
    - Output stored in graphics catalogs
  - SG Graphics -- multiple graphics procedures
    - Code Driven
    - Output can be shared with Microsoft Office products

History of SAS Graphics

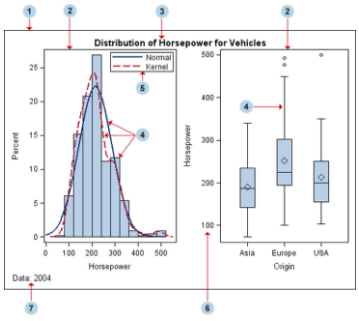
- Graphics Template Language (GTL)
  - An extension of the Output Delivery System (ODS)
  - Quality graphics generated using a template to format graphic layout, text, legends, and appearance.
  - Can create highly customized graphs using a two-part process
- Created for SAS users uncomfortable w/ these features

Features of ODS Graphics Designer

- Drag & Drop / Point & Click version of SG Graphics
  - Wide array of plot types
  - Sophisticated graphs and overlays
  - Don't need to know template details or GTL,
- ODS Designer writes the code for you!
  - Save template for re-use, editing, or sharing
  - A great way to start learning GTL!
- Can create multi-cell graphs, classification panels, and scatterplot matrices in a single file
- Can save graphic as image file for easy portability

Anatomy of SAS Graphics

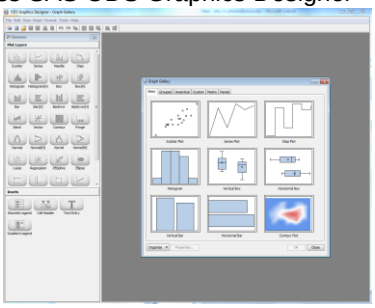
1. Graph
2. Cell
3. Title
4. Plot
5. Legend
6. Axis
7. Footnote



Ref: SAS/GRAPH 9.2 : Graphical Template Language Reference

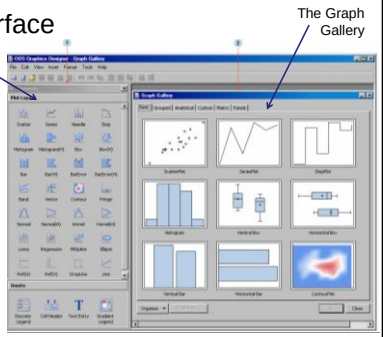
How to Access SAS ODS Graphics Designer

- Method 1:
  - Open SAS
  - Tools\ODS Graphics Designer
- Method 2:
  - %sgdesign()



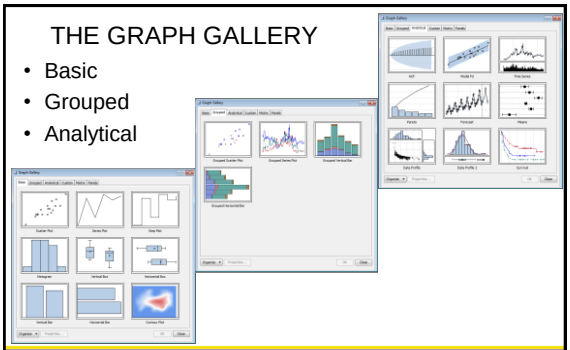
The User interface

1. Element Panel: Contains plots, lines and insets. To insert an element, click & drag to the graph area
2. Work Area: Contains graphs you design



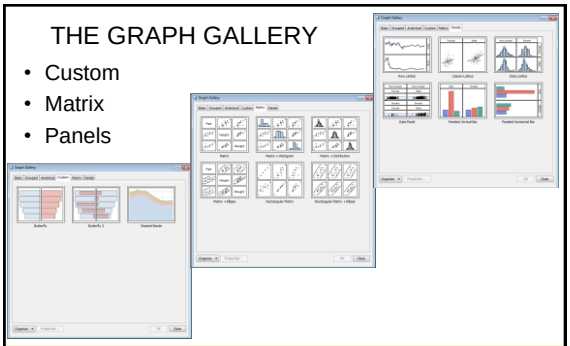
THE GRAPH GALLERY

- Basic
- Grouped
- Analytical



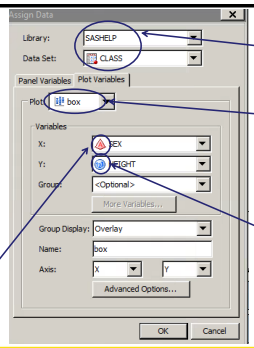
THE GRAPH GALLERY

- Custom
- Matrix
- Panels



How to Assign Data

- After select graph type, Assign Data dialog box opens
- Select data, plot, and variables via drop-downs
- Return to Assign Data screen via a right-click

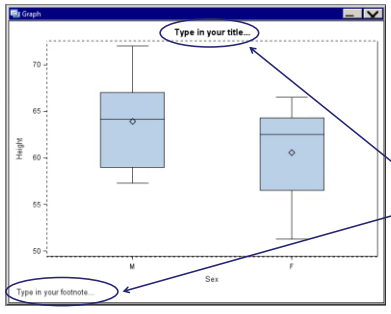


Identify Dataset

Identify Plot Type

Numeric Variable

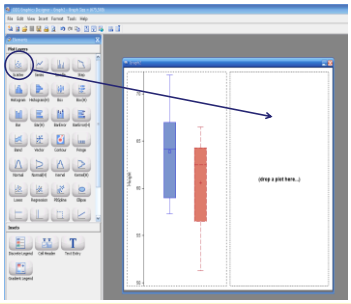
Character Variable



Produced Boxplot of Height by Sex

Can change these defaults, by double clicking on the text

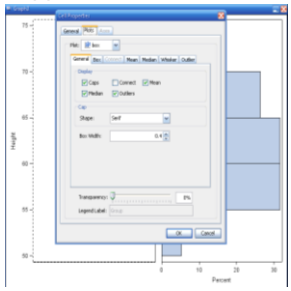
How to Add a chart



- To create a second chart: Right-Mouse click on chart, select “Add Column”
  - Can also choose “Add Row”
- Drag and Drop the desired chart type from the Plot Layers onto the new plot space

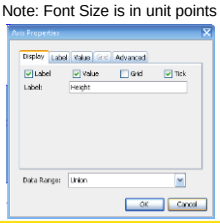
Customize Appearance

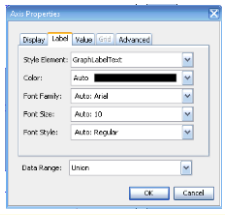
- To change properties of a chart, select component & right-mouse click.
  - Includes Axis Labels, Chart Title, Footnotes, etc.
  - If applicable, may select common row / column axis for multiple charts
  - You can change properties including line thickness, markers, colors, etc.



Label / Axis Changes

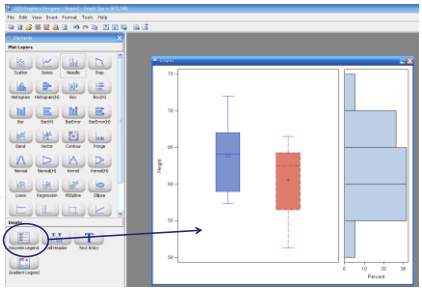
- The Axis Tab allows you to change color, font type, and font size for axes and labels.
  - Each axis has to be changed individually
  - Note: Font Size is in unit points





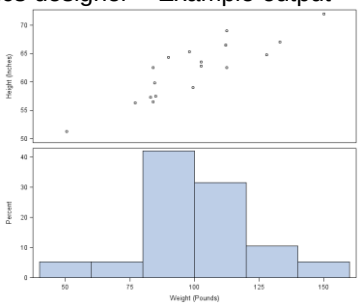
ADDING A LEGEND

- To add legend, simply drag & drop the preferred type to the appropriate chart



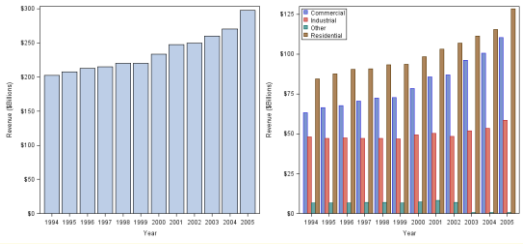
ODS graphics designer – Example output

- Combination Scatterplot and histogram for fictitious height / weight data
- Note the combined horizontal axis



ODS graphics designer – Example output

- Combination Bar Charts of Electric Company Revenue by Year (Left) and Revenue by Customer Type (Right)



The Code

- From the View Tab – Select Code
  - This will open a copy of the graphic template language (GTL) utilized to create the plot
  - Similar to a macro, this code can be modified to create a template for future use!
  - To do so, you should make the code as generic as possible, such that all dynamic arguments start with an underscore and all quotes are removed.
  - This code is also an excellent starting point for more complex graphic templates, including graphics that cannot be built exclusively using the GUI

Graphic Template Language

- Creating a graph with the Graphic Template Language (GTL) is a two-step process
  - Step One: The TEMPLATE procedure
    - Defines the structure of the graphic
    - How the template is compiled and saved
    - Does not create the graph by itself
  - Step Two: The SGRENDER procedure
    - Where the data is defined
    - Creates the graph

Source: Sanjay Matange. Getting Started with GTL – 1– Scatterplots posted October 25, 2013 via Graphically Speaking Blog

Graphic Template Language: Two Steps

- Where graph is defined.

In proc template, the template is assigned a name, which is called in proc sgrender

Step #1

```
proc template;
  define statgraph template-name;
    begingraph / <options>;
      <gtl statements to define the graph>
    endgraph;
  end;
run;
```

Step #2

```
proc sgrender data=data-set-name
              template=template-name;
run;
```

Source: Sanjay Matange. Getting Started with GTL – 1– Scatterplots posted October 25, 2013 via Graphically Speaking Blog

Simple scatterplot example

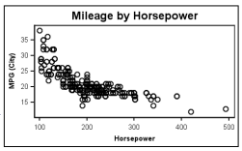
```
/*--Define the template--*/
proc template;
  define statgraph scatter;
    begingraph;
      entrytitle 'Mileage by Horsepower';
      layout overlay;
        scatterplot x=horsepower y=mpg_city;
      endlayout;
    endgraph;
  end;
run;

/*--Render the Graph--*/
proc sgrender data=sedans template=scatter;
run;
```

Most of this code is standard. The key component defining the plot is here.

Note: the Layout overlay is the most basic container for single-cell plots

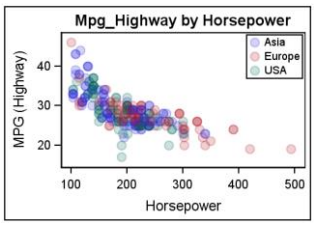
This code yields this simple scatterplot



Source: Sanjay Matange. Getting Started with GTL – 1– Scatterplots posted October 25, 2013 via Graphically Speaking Blog

A More Complicated Scatterplot

- In the ODS Graphic Designer, it is a simple task to add a group component to the scatterplot
- We can also use this code to demonstrate the use of GTL with dynamic features



Source: Sanjay Matange. Getting Started with GTL – 1– Scatterplots posted October 25, 2013 via Graphically Speaking Blog

GTL with dynamic options

```
/*--Dynamic Scatter Plot--*/
proc template;
  define statgraph dyn_scatter;
    dynamic _x _y _grp _valign;
    begingraph;
      entrytitle _y ' by ' _x;
      layout overlay;
        scatterplot x=_x y=_y / group=_grp datatransparency=0.8
                name='a' markerattrs=(symbol=circlefilled size=10);
        if (exists(_grp))
          discretelegend 'a' / location=inside
            valign=_valign halign=right across=1;
        endif;
      endlayout;
    endgraph;
  end;
run;

proc sgrender data=sedans template=dyn_scatter;
dynamic _x='Horsepower' _y='Mpg_Highway' _grp='Origin' _valign='Top';
run;
```

Calling the dynamic feature makes the template more flexible

The dynamic variables (note the underscore)

Defines use of a filled circle w/ 80% transparency

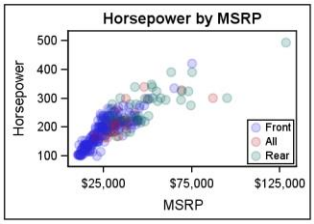
Defines location and alignment of the legend

Value of dynamic variables defined in SGRENDER

Source: Sanjay Matange. Getting Started with GTL – 1– Scatterplots posted October 25, 2013 via Graphically Speaking Blog

Why Use Dynamics?

- Allows one to use same template to create multiple graphs
- Simply change variable definitions in SGRENDER
- Example:




```
proc sgrender data=sedans template=dyn_scatter;
dynamic _x='MSRP' _y='Horsepower' _grp='Drivetrain' _valign='Bottom';
run;
```


For More In-Depth Description of GTL Code Manipulation

- References:
- Using the ODS Graphics Designer to Create Your Own Templates. Philip R Holland. Paper 034-2010, SAS Global Forum 2010
- ODS Graphics Designer in SAS 9.2 TS2M3 PowerPoint by John Kirtz
- ODS Graphics Designer (Creating Templates for Batchable Graphs) PowerPoint by Barry Hong

Additional References

- SAS Documentation
- SAS9 ODS Graphics Tip Sheet (Handout)
- Graphically Speaking Blog by Sanjay Matange
  - This blog is particularly helpful!
  - Provides plot examples along with the corresponding GTL with descriptions.
- Graphically Speaking - Visual Index
- Graph Focus Areas