SAS® ODS Graphics Designer

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Overview of Slide Presentation

- Evolution of ODS Graphics
  - Early Development of SAS Graphics
  - Structural Anatomy of SAS Graphics
  - Graphics Template Language (GTL)
  - Latest Features of SAS Graphics
- Accessing ODS Graphics Designer
  - The User Interface
  - The Graph Gallery
- How to Build a Simple ODS Graph
  - Step 1: Select Graph Type
  - Step 2: Select Data, Plot, Variables
  - Step 3: Customize and Produce Graph
- How to Build a Multi-Cell Graph
  - Ad-Hoc Multi-Cell Graph
  - Classification Panels
  - Scatter Plot Matrix
- How to View the GTL Code
- Building Complex Graphic Templates in GTL
- Creating Templates for Batchable [Repeatable] Graphs
- Auto Charts with SAS 9.4
- Learn More
  - References and Review Exercises

Evolution of ODS Graphics

Early Development of SAS Graphics

- ***In the beginning SAS had a less than stellar reputation regarding graphics output.***
  - *PROC PLOT* produced crude raster graphics using a line printer.
- ***Then there was SAS/GRAPH and visuals became better.***
  - Vector graphics used to produce quality output.
  - Lots of options but too many to learn well (difficult to use “on the fly”).
  - Output was stored in graphics catalogs (required prior knowledge).
  - Not too friendly with Microsoft Office products.
- ***Finally came the development of ODS Statistical Graphics Procedures.***
  - Introduced multiple graphics operations incorporated within SAS statistical procedures in Base SAS or as stand-alone SAS procedures (SGPLOT, SGPANEL, SGSCATTER).
  - Still code driven but new graphics template language developed.
  - PNG output files sharable with Microsoft Office products.

How to Create Graphs Automatically From Within SAS Procedures

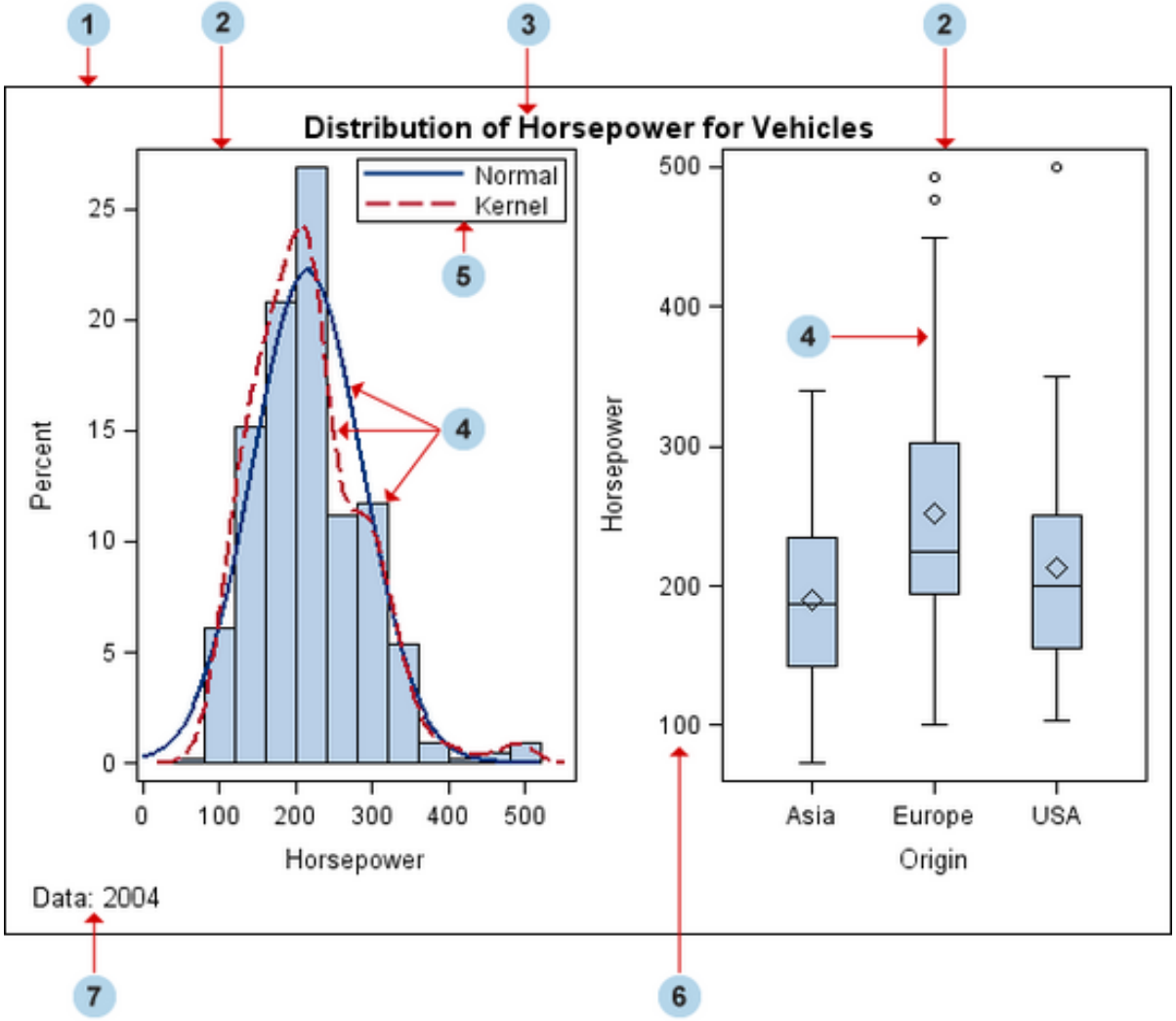
```
ods graphics on;
        proc freq data = demo;
        tables race/plot = freqplot;
        run;
ods graphics off;
```

Note: In SAS 9.4 ODS graphics are by default turned "on" and graphs are automatically generated. If you do not want these graphs you can type the command "ods graphics off" prior to the PROC statement.

Use of Output Delivery System (ODS) commands allows you to create PDF, RTF, or HTML files that contain graphical content. **Note: By default, SAS 9.4 produces output in HTML.**

Structural Anatomy of SAS Graphics

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



Source: SAS/GRAPH 9.2 : Graphical Template Language Reference

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
- Created for SAS users uncomfortable with these features
- Can create highly customized graphs using a two-part process
- Fully compatible with Microsoft Word and PowerPoint

Latest Features of SAS Graphics

- Drag & Drop/Point & Click version of SG Graphics
  - Wide array of plot types to choose from
  - Produces sophisticated graphs and overlays
  - Do not need to know template details or GTL
- ODS Designer writes the code for you
  - Save template for re-use, editing, or sharing
  - 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
- Can customize appearance to meet publication standards

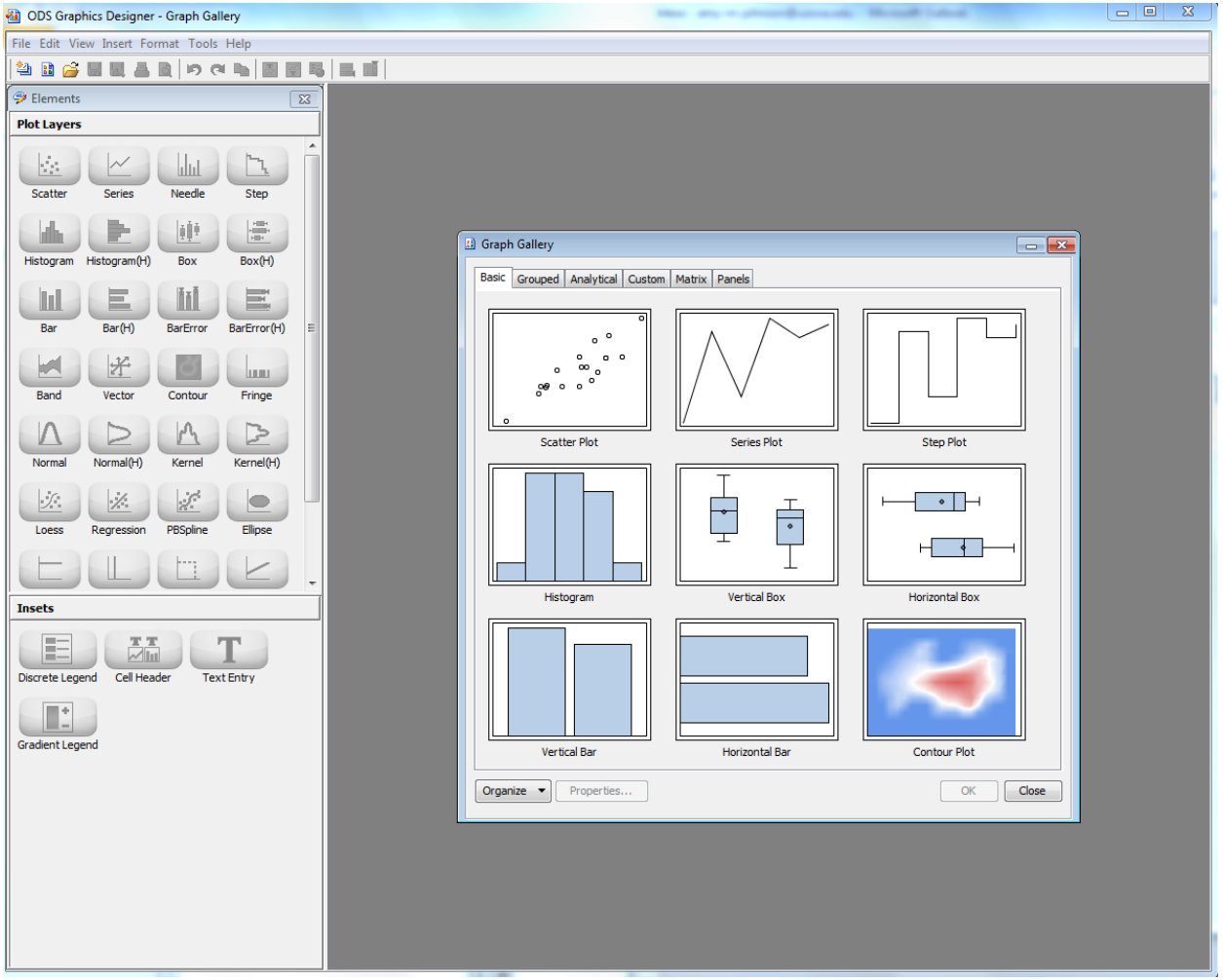
Accessing ODS Graphics Designer

Method 1:

- Open SAS
- Tools\ODS Graphics Designer

Method 2:

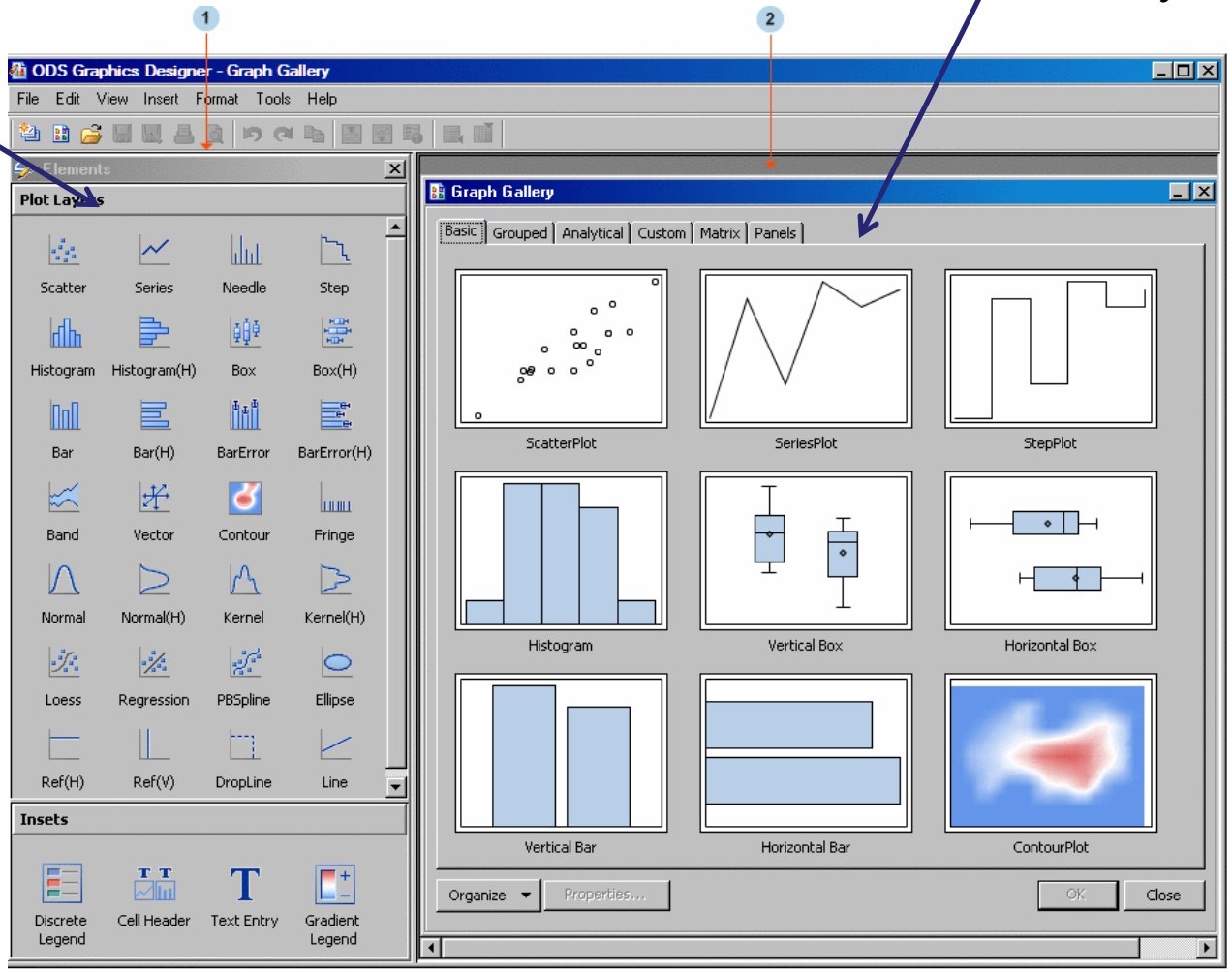
- %sgdesign
- %sgdesign (*parameters*)



The User interface

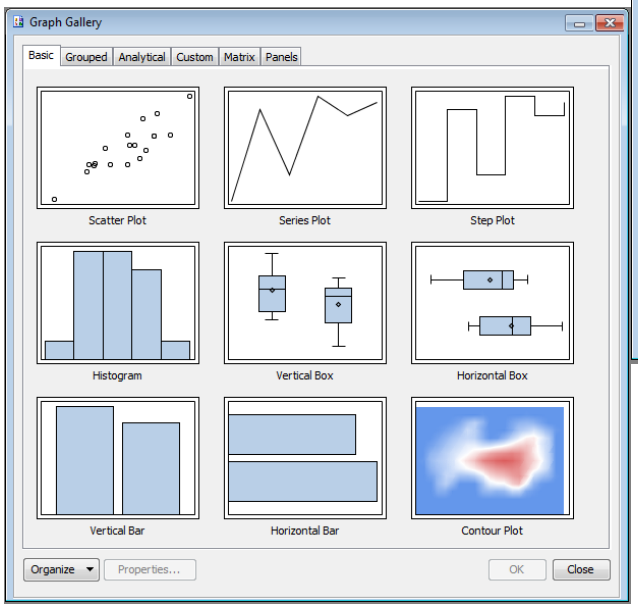
1. **Element Panel:** Contains plots, lines and insets. To insert an element, click & drag to the graph area

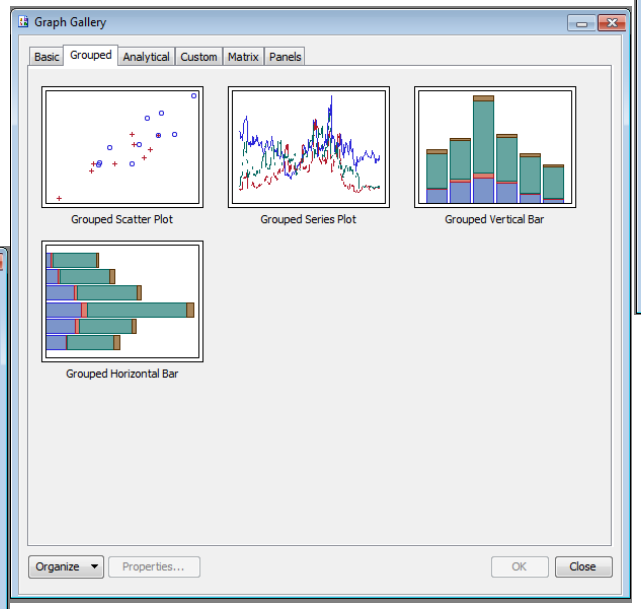
2. **Work Area:** Contains graphs you design

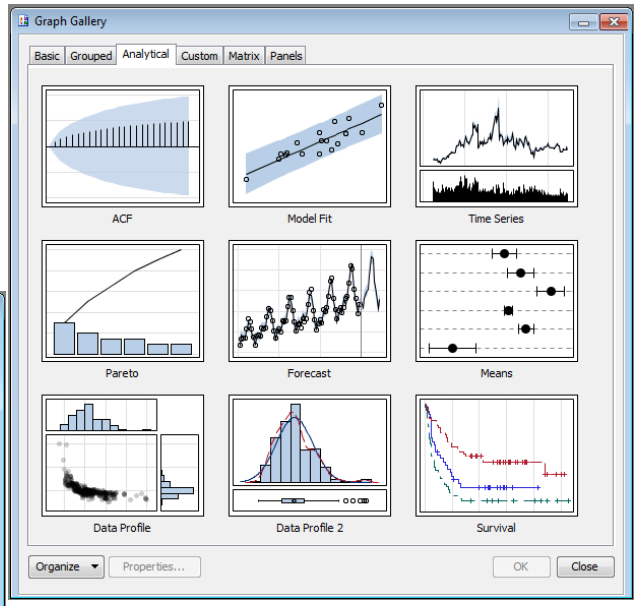


THE GRAPH GALLERY

- Basic
- Grouped
- Analytical

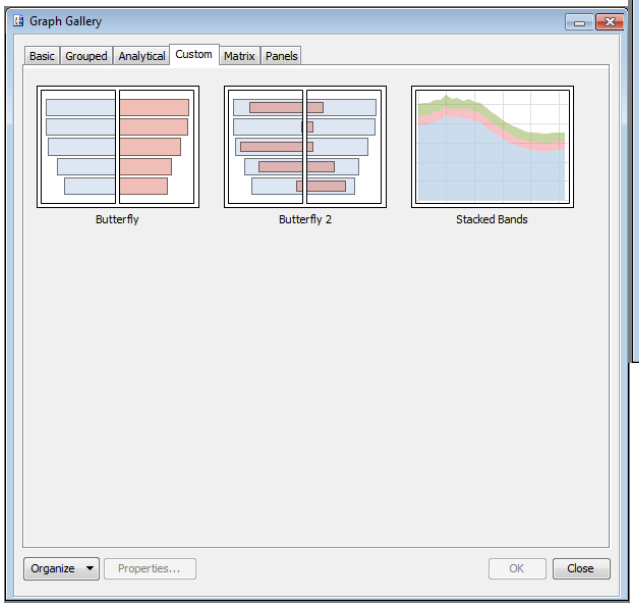


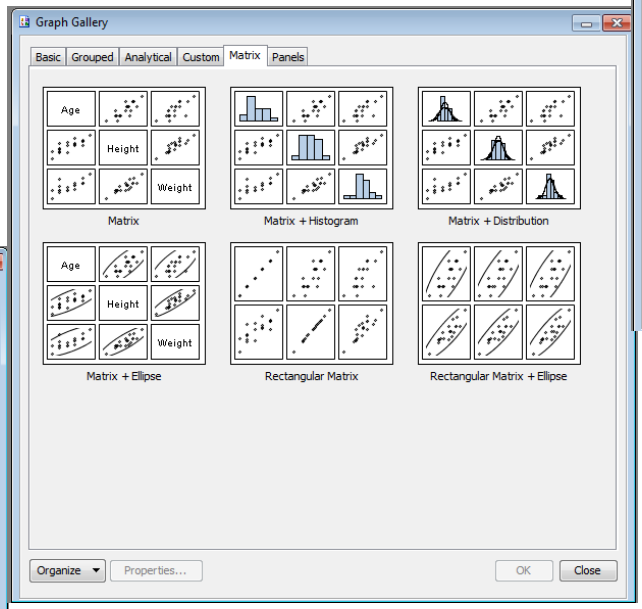


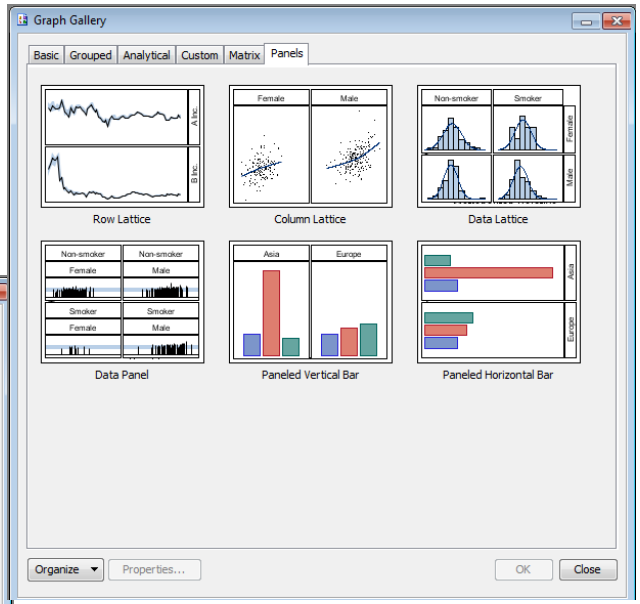


THE GRAPH GALLERY

- Custom
- Matrix
- Panels





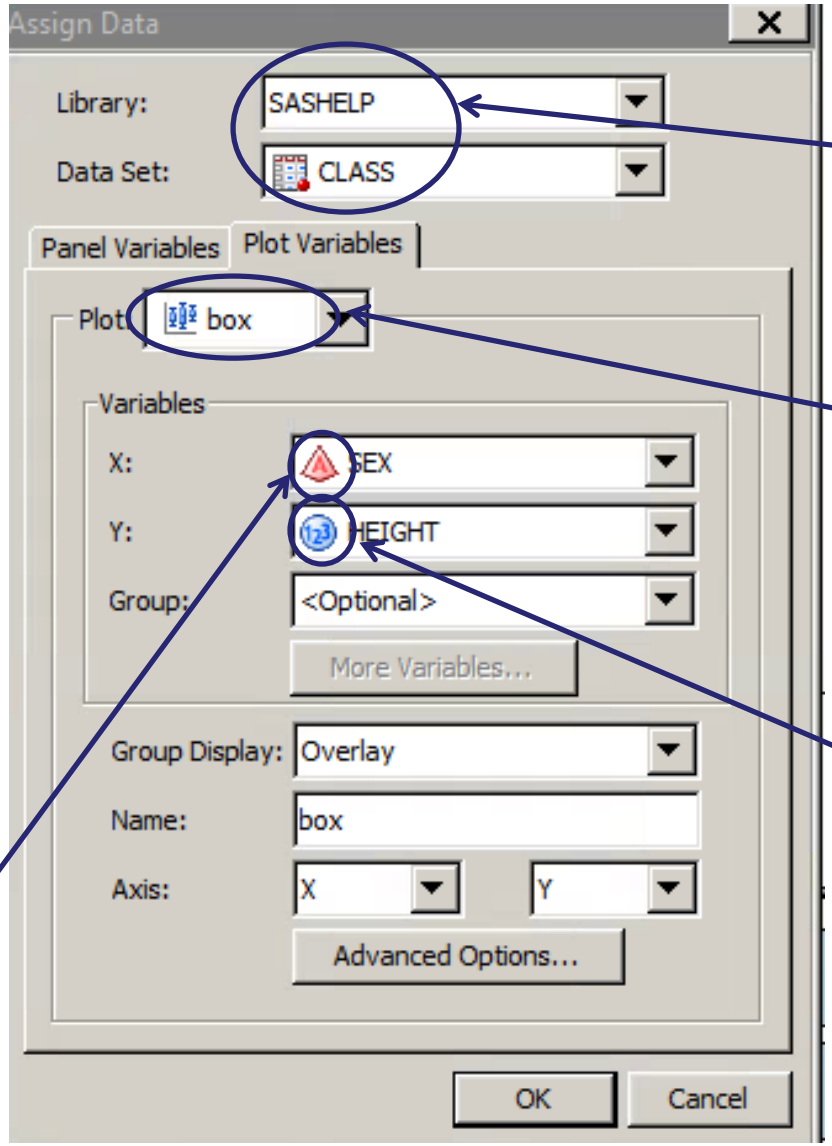


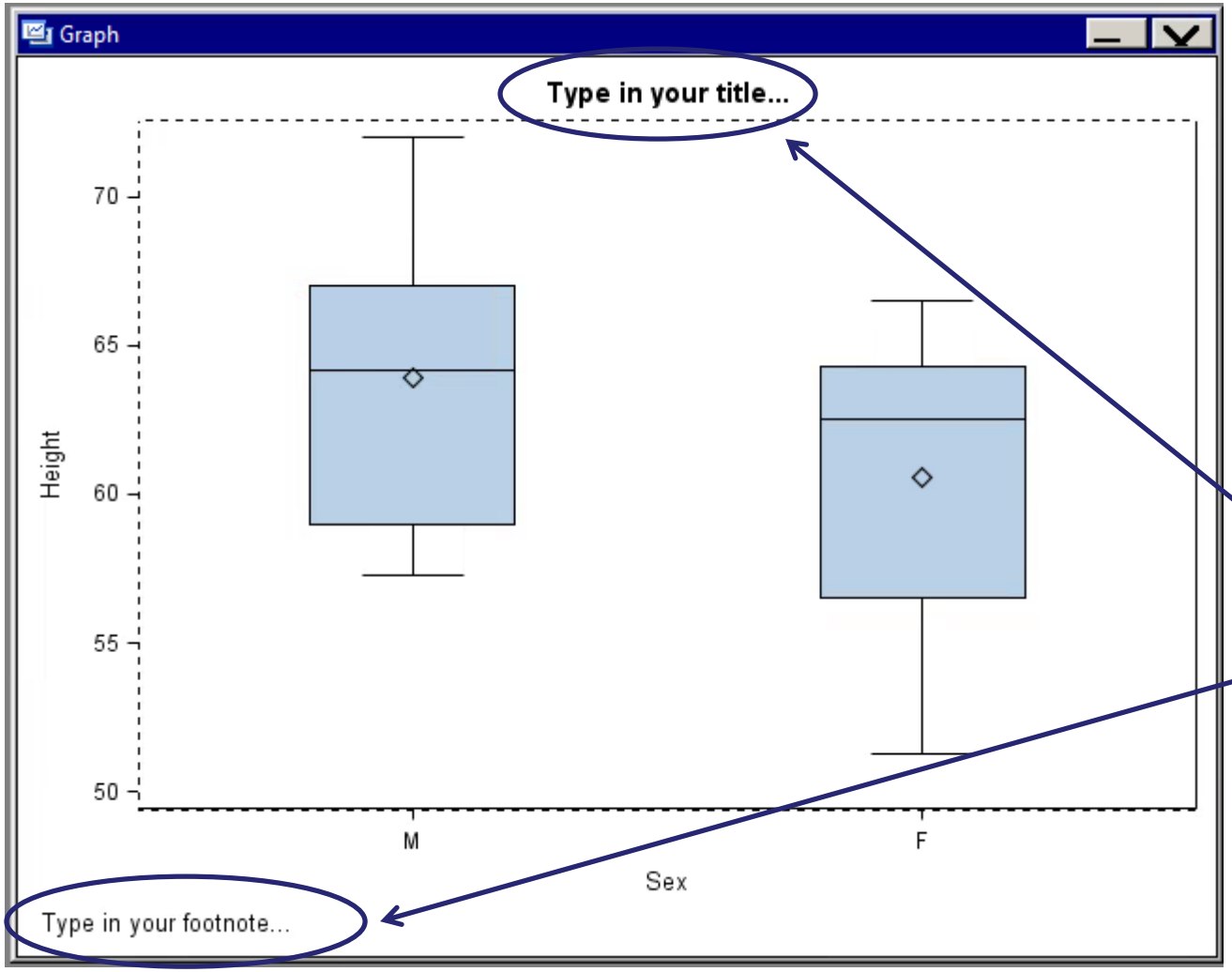
How to Build a Simple Graph

Step 1. After select graph type, Assign Data dialog box opens

Step 2. Select data, plot, and variables via drop-downs

Step 3. Return to Assign Data screen via a right-click

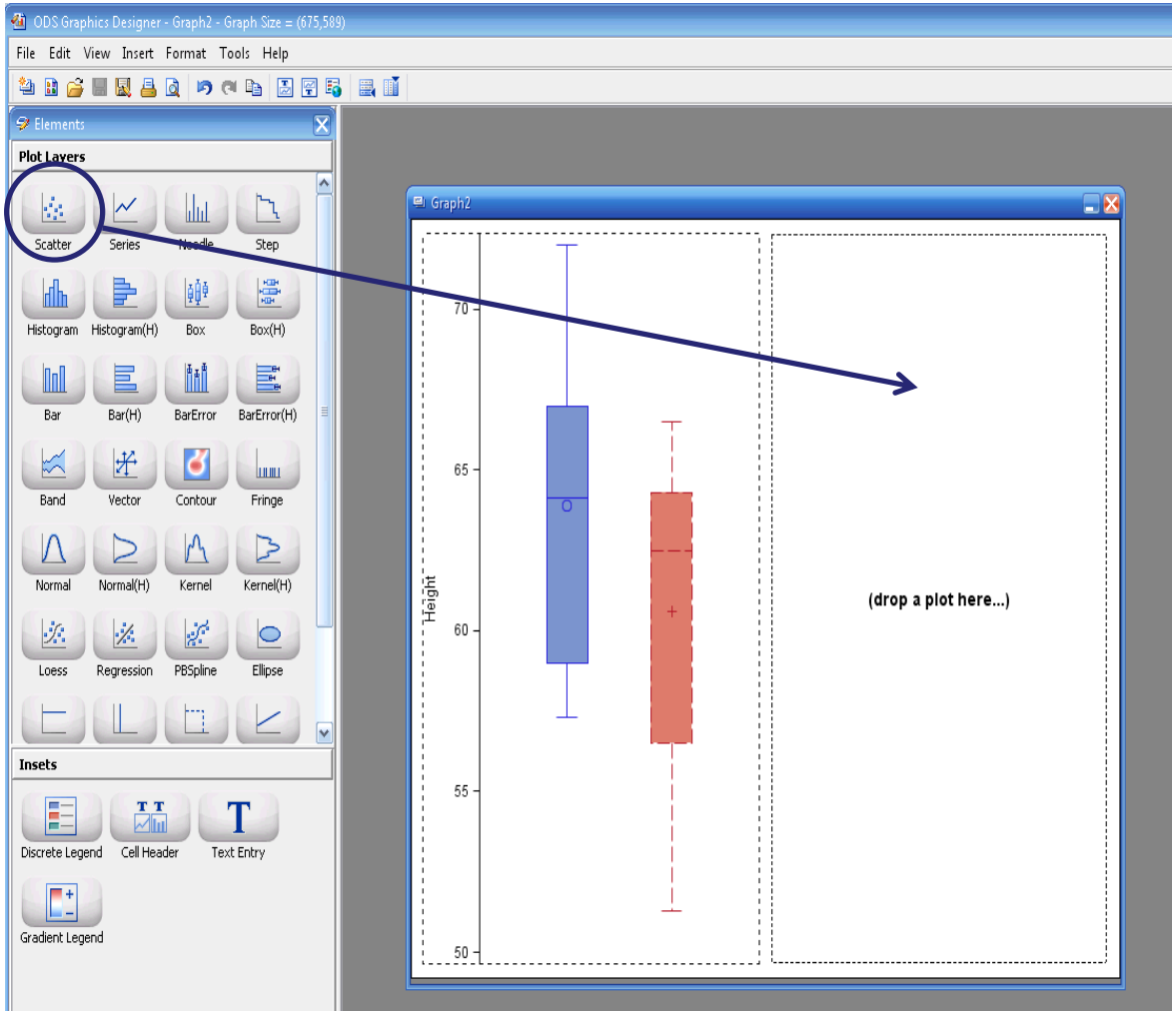




Produced Boxplot of Height by Sex

Can change these defaults, by double clicking on the text

How to Add a chart

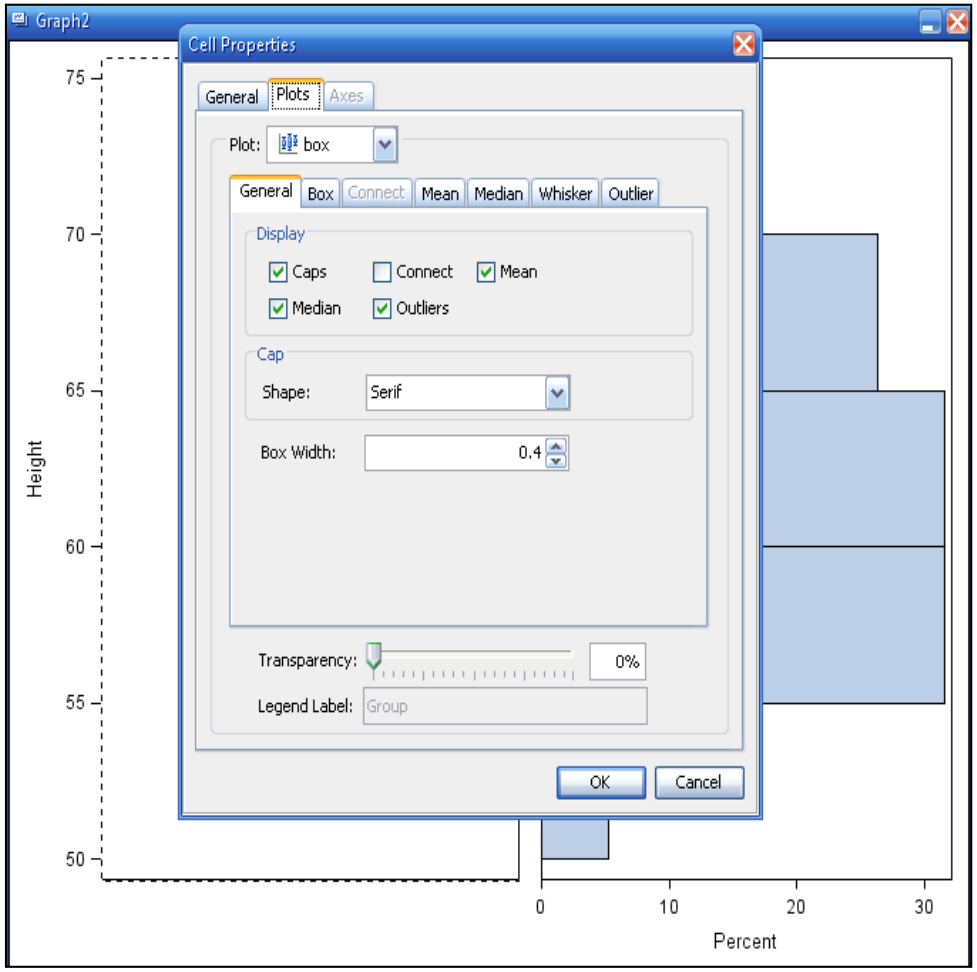


- To create a second chart: Right-Mouse click on chart and select Add Column
- Can also choose Add Row
- Drag and Drop the desired chart type from the Plot Layers onto the new plot space

Customize Appearance

To change properties of a chart, select component & right-mouse click.

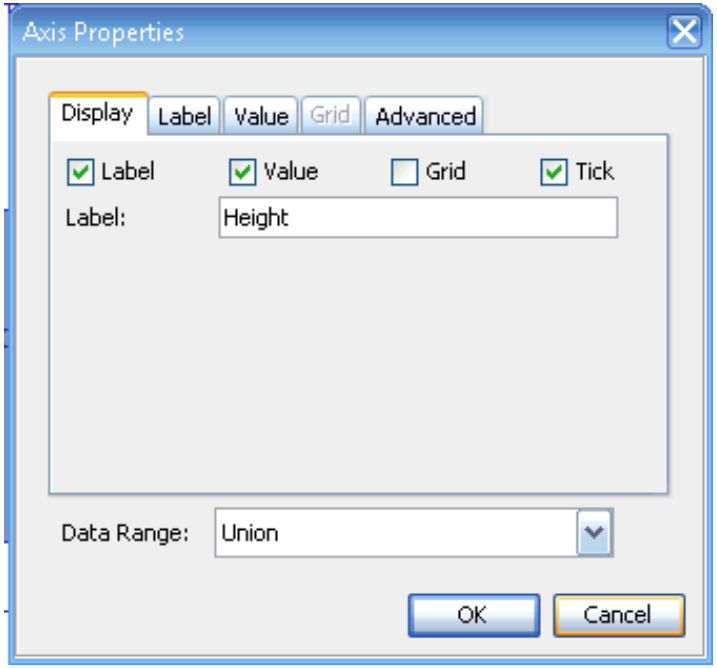
- Includes Axis Labels, Chart Title, Footnotes, etc.
- If applicable, may select common row/column axis for multiple charts
- You can change properties including line thickness, markers, colors, etc.

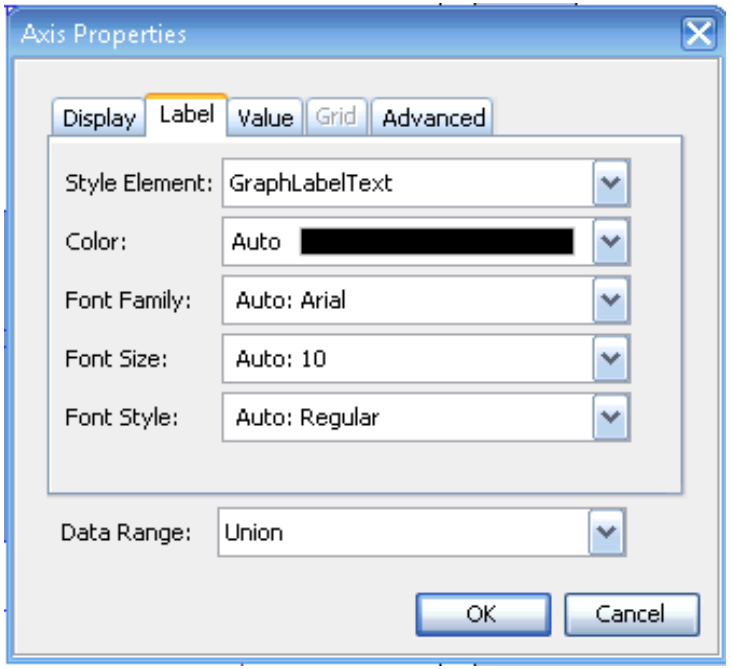


Label/Axis Changes

The Axis tab allows you to change color, font type, and font size for axes and labels.

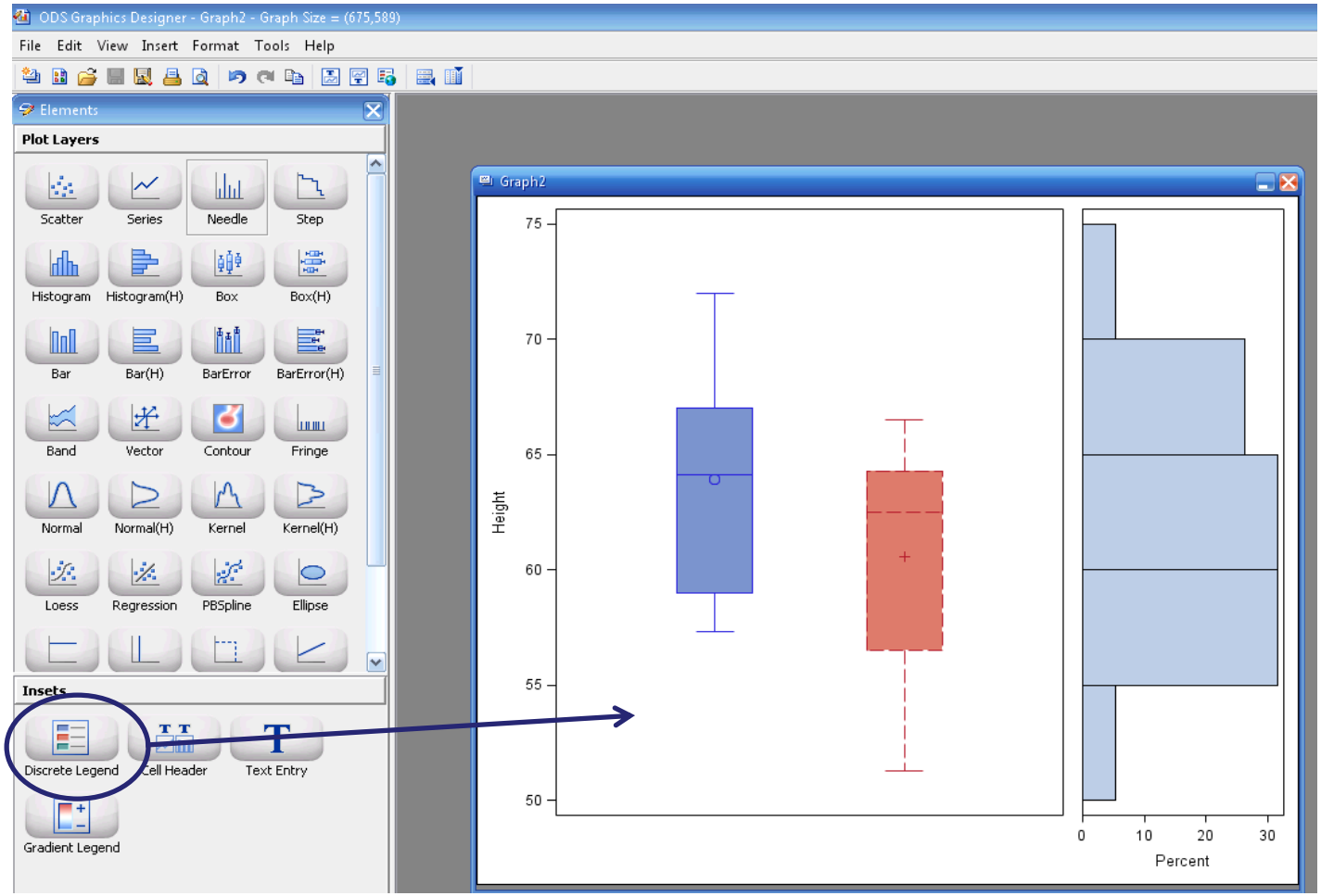
- Each axis has to be changed individually
- Note: Font Size is in unit points





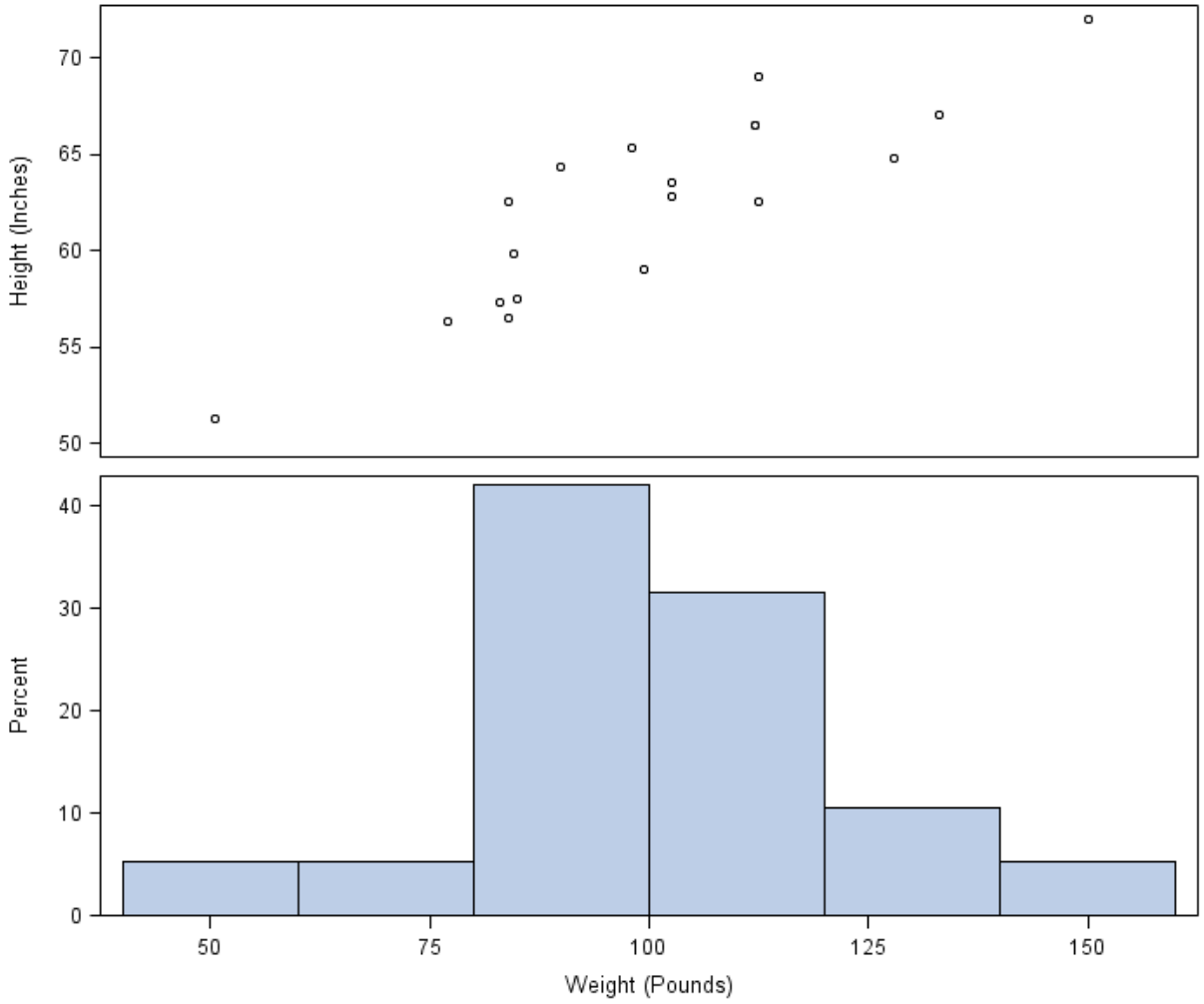
ADDING A LEGEND

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



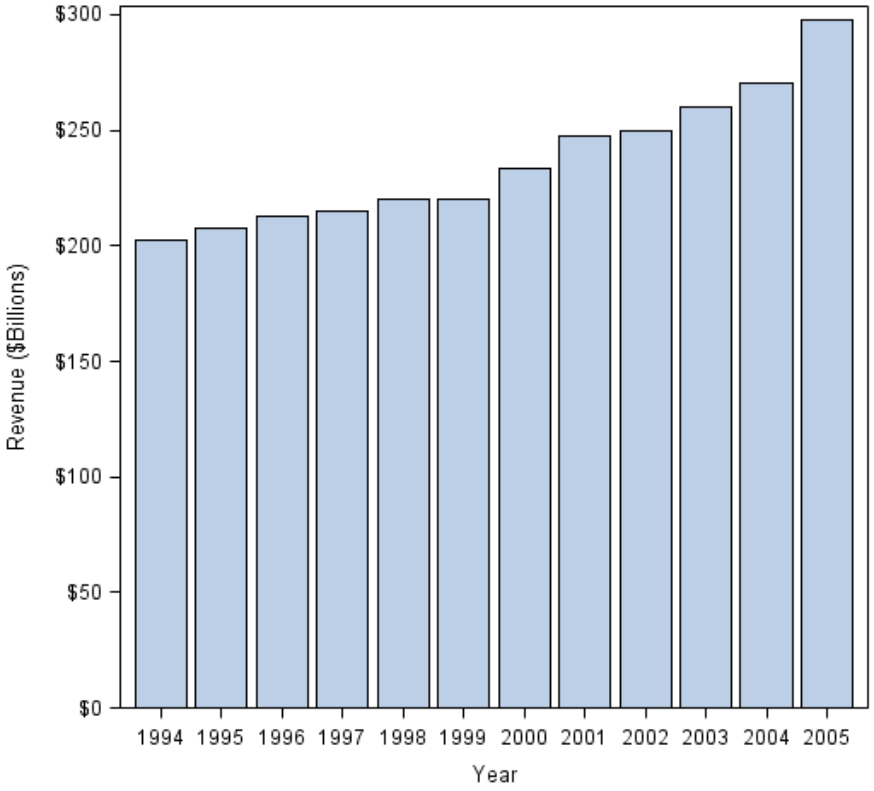
ODS Graphics Designer – Example Output

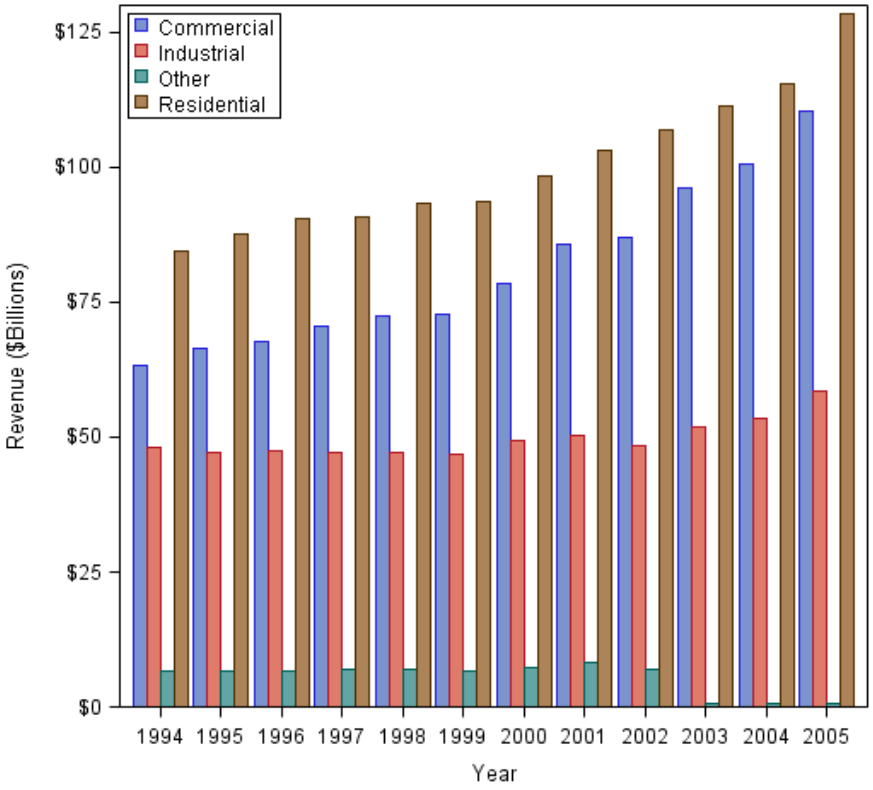
- Combination Scatterplot and histogram for fictitious height /weight data
- Note the combined horizontal axis



ODS Graphics Designer – Example Output

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





How to View the GTL 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 interface.

Creating Templates for Batchable Graphs

- Graphs created by Graphics Designer can be saved as SGD files.
- SGD files execute in batch mode using the SGDESIGN Procedure.
- The SGD file includes a reference to the data set used when creating the graph. The same data set is used unless a different name is provided.
- Graphics Designer allows usage of multiple data sets for a single graph (one per cell).
- Dynamics in the graph can be substituted at runtime.

Auto Charts with Designer in Sas 9.4

- A new tool under **Tools->Auto Charts** allows the user to create a gallery of commonly used graphs for a set of variables in bulk.
- Univariate, bivariate, grouped and advanced graphs are available.
- This user-defined group of graphs (created by selection of particular variables and settings) can be placed in a custom gallery (MyGraphs).
- This gallery can be opened at any time for further customization and use.

Building Complex Graphic Templates in GTL

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

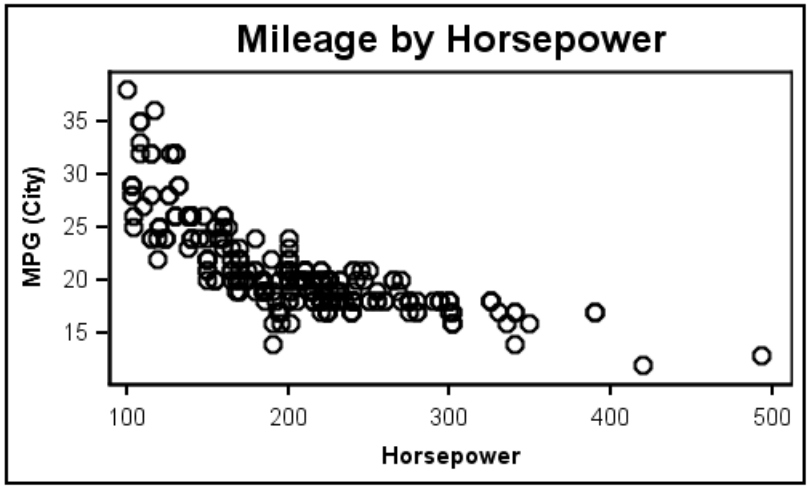
```
/*--Define the template--*/
proc template;
  define statgraph scatter;
    begingraph;
      entrytitle 'Mileage by Horsepower';
      layout overlay;
        scatterplot x=horsepower y=mpg_city;
      endlayout;
    endgraph;
  end;
run;

/*--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.

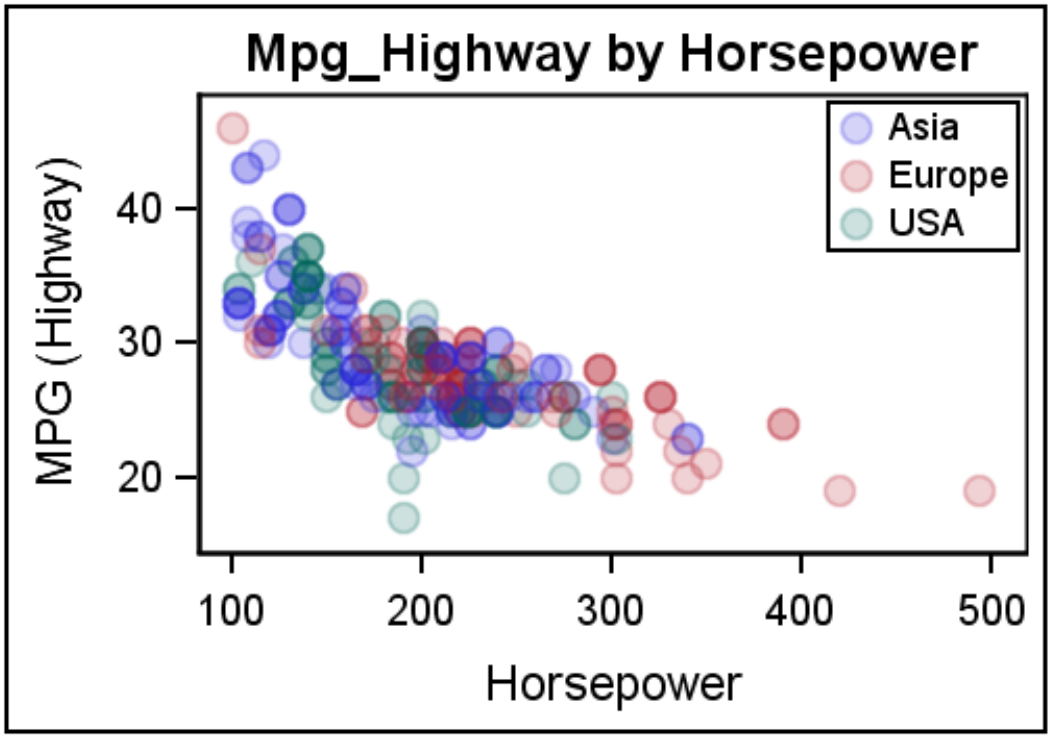


Source: Sanjay Matange. Getting Started with GTL – 1– Scatterplots posted October 25, 2013 via Graphically Speaking Blog

Complicated Scatterplot Example

In the ODS Graphic Designer, it is a simple task to add 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;
```

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

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

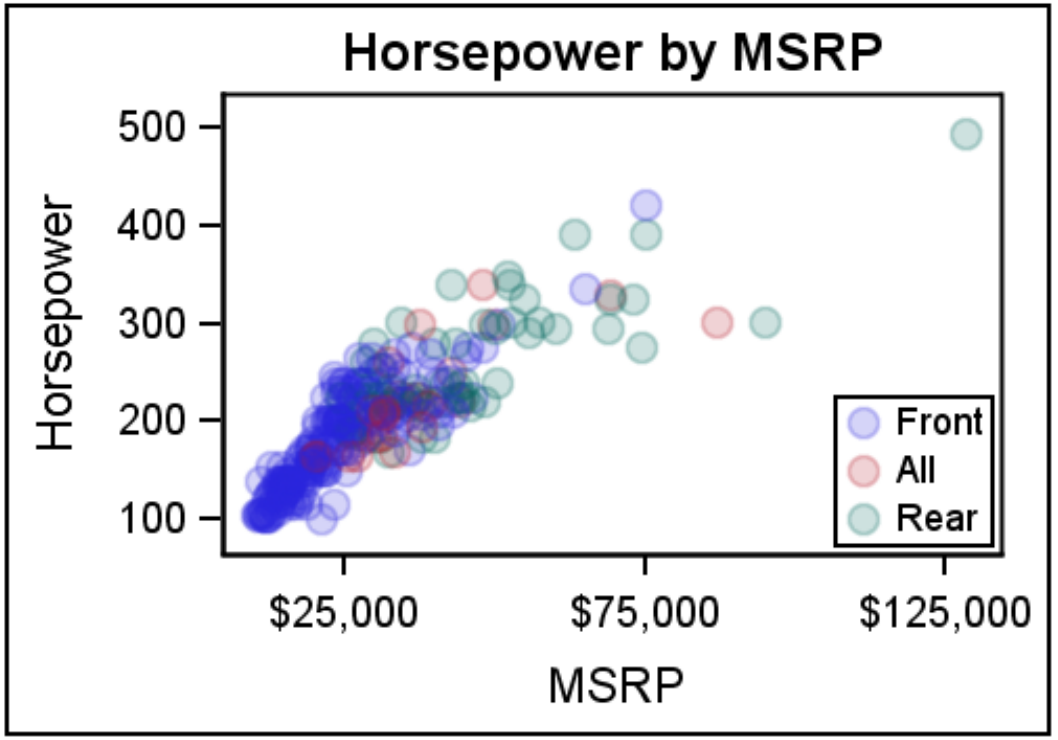
Value of dynamic variables defined in SGRENDER.

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:

  Horsepower by MSRP using Dynamics template




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

Learn More

- **Documentation**

  SAS® 9.4 ODS Graphics Designer: User's Guide, Third Edition
  http://documentation.sas.com/api/docsets/grstatdesignug/9.4/content/grstatdesignug.pdf?locale=en

  SAS® 9.4 ODS Graphics: Getting Started with Business and Statistical Graphs
  https:/support.sas.com/documentation/cdl/en/grsggs/64979/PDF/default/grsggs.pdf

- **Papers**

  Sanjay Matange. *Quick Results with SAS® ODS Graphics Designer.*
  https://support.sas.com/rnd/datavisualization/papers/sgf2012/153-2012.pdf

  Philip R Holland. *Using the ODS Graphics Designer to Create Your Own Templates.*
  https://support.sas.com/resources/papers/proceedings10/034-2010.pdf

- **Presentations**

  Charlotte Baker. *Need a Scientific Journal Ready Graphic? No Problem!*
  http://support.sas.com/resources/papers/proceedings17/1440-2017.pdf

- **Blogs**

  Sanjay Matange. *Graphically Speaking: Data Visualization with a focus on ODS Graphics.*
  https://blogs.sas.com/content/graphicallyspeaking/tag/ods-graphics-designer/