

Easing into Data Exploration, Reporting, and Analytics Using SAS® Enterprise Guide®

Marje Fecht, Prowerk Consulting

ABSTRACT

Whether you have been programming in SAS® for years, are new to it, or have dabbled with SAS® Enterprise Guide® before, this hands-on workshop sheds some light on the depth, breadth, and power of the Enterprise Guide environment. With all the demands on your time, you need powerful tools that are easy to learn and deliver end-to-end support for your data exploration, reporting, and analytics needs. Included are the following:

- data exploration tools
- formatting code—cleaning up after your coworkers
- enhanced programming environment (and how to calm it down)
- easily creating reports and graphics
- producing the output formats you need (XLS, PDF, RTF, HTML, PPT)
- workspace layout
- productivity tips.

This workshop uses SAS Enterprise Guide 7.1, but most of the content is applicable to earlier versions.

INTRODUCTION

As an analyst, you probably need to provide actionable insights to enable effective decision making. With all of the demands on your time, you need powerful tools that are quick to learn and deliver end-to-end support for your analytics needs. SAS Enterprise Guide provides you with a wealth of tools to help you easily turn all that data into useful information.

This paper will help you understand:

- What tools are available for exploring and understanding your data
- How to use the tools for data exploration, analytics, reporting, and presentation
- How to easily create a variety of output formats to display your results
- How to customize the environment to improve your productivity.

Because of the flexibility of SAS Enterprise Guide, there are usually many paths you can take, and tools you can use to accomplish the same tasks. This presentation describes a few, but not all, approaches to each task.

EXPLORING AND UNDERSTANDING YOUR DATA

How can you easily get a feel for your data?

Perhaps you eyeball the data, OR if you are a SAS Programmer, you may run a series of Procedures like CONTENTS, FREQ, SUMMARY, GCHART, GPLOT, SGPLOT, SGSCATTER, etc.. But, there is a much easier and more effective approach!

QUICK AND EASY LOOK AT THE DATA

My first stop with any new set of data is the **SAS Enterprise Guide Data Explorer**, which enables you to:

- View all or a portion of your detail data
- Easily create charts and graphs to explore the variables, and quickly highlight possible issues and outliers
- Highlight the “top 10” values of variables
- And produce many other statistics of your choosing.

How do you access the Data Explorer?

There are multiple ways to access the Data Explorer (File → Open → Data Exploration) but my preference is:

- In the **Server List** window, you can view a list of the available servers, libraries, and SAS files.
- Use the plus sign (+) to expand the Servers and Libraries, and navigate to the dataset of interest
- Right click on the dataset and select **Explorer**
- **Tip:** If you want to Explore Temporary (WORK) datasets – OR – if you are working with LARGE data - see the tricks in the FAQ at

<http://blogs.sas.com/content/sasdummy/2014/02/17/favorite-eg-tricks-fecht/>

<http://blogs.sas.com/content/sasdummy/2014/07/09/performance-tips-sas-eg-datagrid/>

- **Note:** The Data Explorer options are normally configured to limit the number of rows and columns that are available (by default).
- Once you are in the explorer window, you can:
 - Apply **filters** to control which variables and rows you view
 - Request **Quick Stats**, to view charts, plots, summary statistics, and more
 - Customize the environment to control
 - Usage with large data
 - Statistics that appear by default for character, numeric, date/time, and currency variables. Just select the **Select Statistics** tool in the Quick Stats view.
 - And many other options (SAS Enterprise Guide has A LOT of options!!).

To illustrate some of the features, see Figure 1 to view a portion of the data in SASHELP.HEART and notice:

- Icons next to variable name describing the data type (numeric, character, currency, date)
- Quick Stats view on the right
 - **Tools** let you control data display (rows, columns)
 - **Select Statistics** lets you choose the default graphics and statistics to display for each of the 4 data types
 - For Character variables, the default statistics include:
 - # of distinct values
 - Count
 - Vertical Bar chart showing frequencies
 - Top Distinct values – including frequencies for each (up to Top 10)
 - Notice that numeric variables have different default statistics.

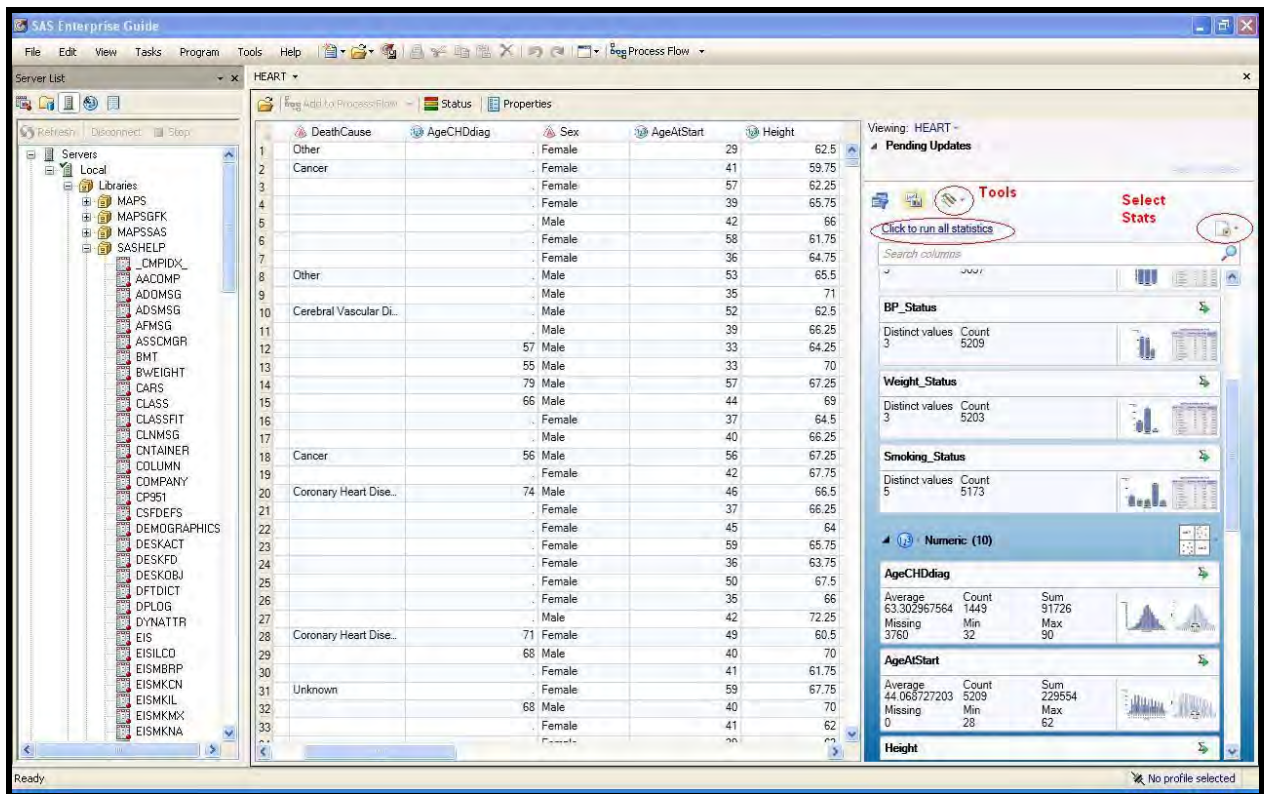


Figure 1 - Data Explorer - with Quick Stats on all variables

If you click on one of the graphics or tables in the Quick Stats view, it magnifies.

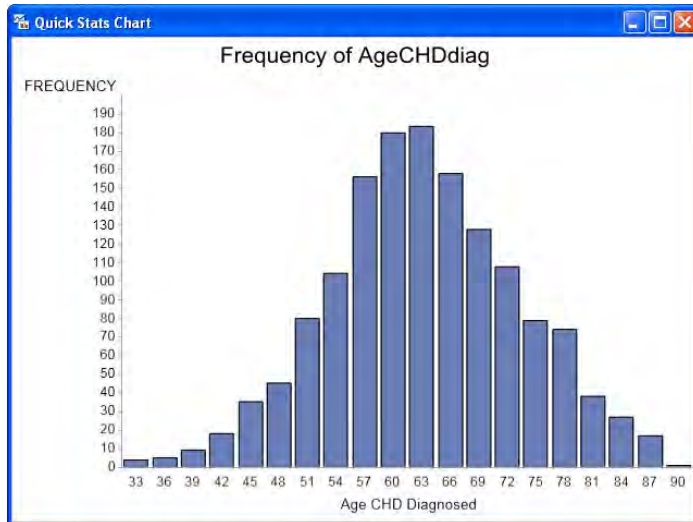


Figure 2 - Frequency Chart for AgeCHDdiag

DIG DEEPER – FIND THE ISSUES AND ANOMALIES

In the Data Explorer, you can focus in on areas of concern by using the Filters to explore subsets of data. The filters can be defined either in the **Data View List** view in the right pane, or by selecting the filter tool in the column of interest. When you apply filters, and rerun **Quick Stats**, the statistics represent just the subset of data so that you can focus in to find issues and anomalies.

TIP: SAS doesn't APPLY the filters (select columns, subset data, sort) until you select **Apply Updates**.

In addition to the **Data Explorer** for reviewing your data, filtering, and viewing subsets of data, there are many “built-in” Enterprise Guide tasks to easily accommodate further data investigations. Select **Tasks** → **Browse** from the menu bar, to select from a large selection of built-in tasks. **No Coding required!**

Tasks provide easy access to the tools you need to explore, summarize, visualize, analyze, report, and so on. You can access tasks by Category, Name, Procs, and even visual representations.

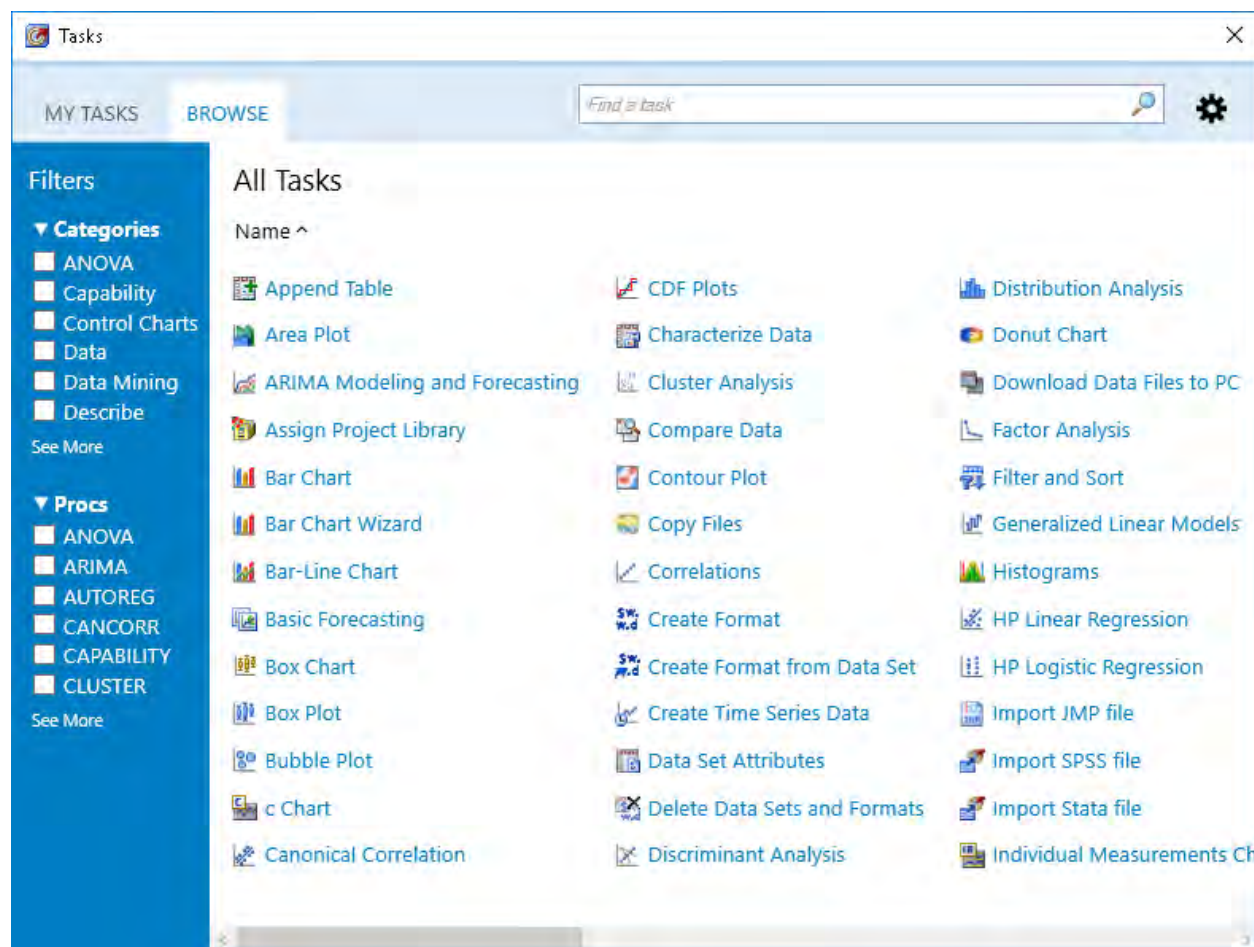


Figure 3 Tasks

The task information includes the underlying SAS **Procedure**, if applicable. This can be useful if you need additional documentation on how the procedure handles data, methodologies, etc.

If you want univariate descriptions of all of your variables, similar to the **Data Explorer** results, select **Tasks** → **Describe** → **Characterize Data . . .** The **Characterize Data Wizard** will step you thru the selections and produce results that can easily be printed or saved for later usage.

EASILY CREATING REPORTS AND GRAPHICS

To help you understand the underlying relationships in your data, SAS Enterprise Guide provides extensive graphics and analytics capabilities, through the built-in tasks.

SCATTERPLOT MATRIX

For example, suppose you want to explore the relationships between 4 of the variables in the heart data, for different subsets of data. You can produce a **Scatter Plot Matrix** and easily control the features of the graphic. To get started, select **Tasks** → **Graph** → **Scatter Plot Matrix . . .**

Notice that the task lets you specify filters, variables to include in the scatter plot matrix, grouping variable (separate plotting symbols for each group), and even gives you the option of including a Histogram along the diagonal to better understand the distribution of each variable.

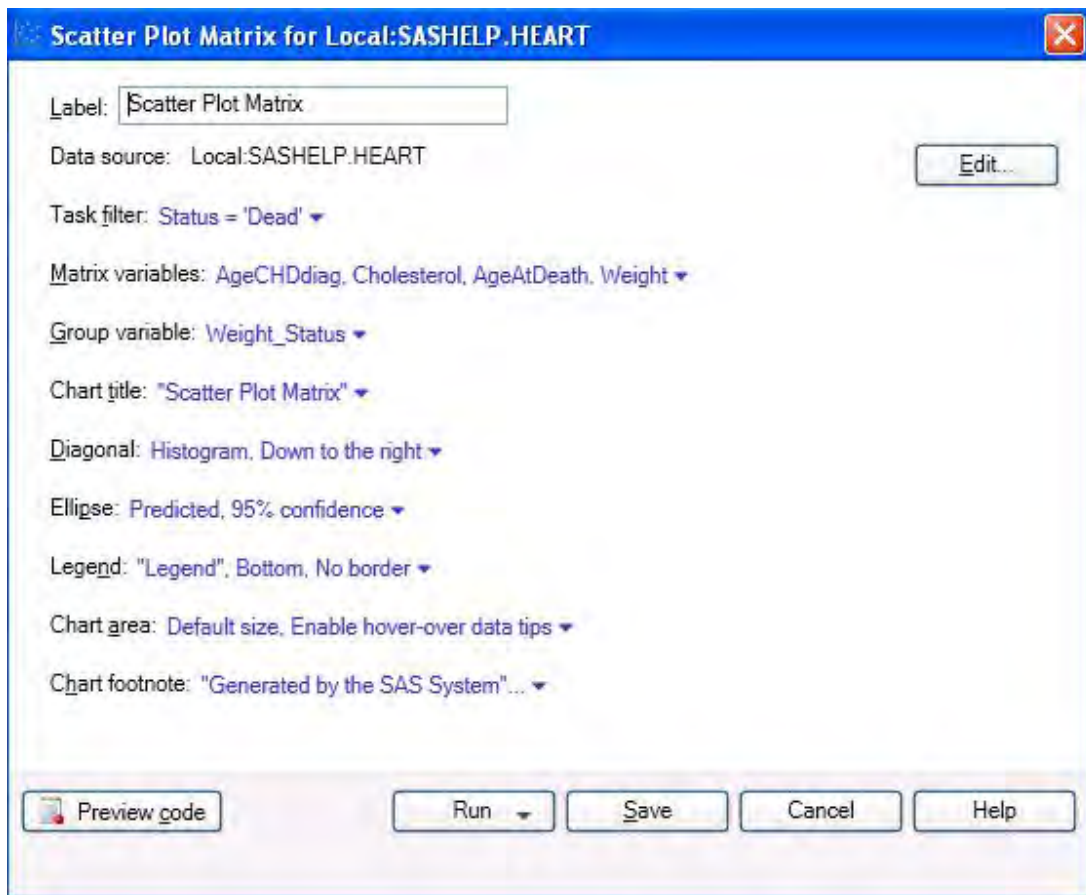


Figure 4 - Scatter Plot Matrix to explore relationships between variables

Behind the scenes, this task generates a program which uses PROC **SGSCATTER**. For the tasks that generate SAS code, you can view the code (select **Preview Code**), learn from the code, save it as part of other programs, and add additional options to your code that the task might not enable.

Notice the **Help** button. Every task has help to guide you through the choices and capabilities so that you can use the task effectively.

When you select **Run**, the task will produce your Scatter Plot matrix. Notice:

- Histogram for each variable along the diagonal
- Scatter plot of each pair of variables
- Plotting symbol represents the grouping variable *Weight Status*
- Additional tabs can be opened to view
 - SAS **code** that is created for the task
 - **Log** with any messages
- If you need to make changes to your selections, select **Modify Task**
- You can **export** the results in a variety of formats. This will be discussed later in this paper.

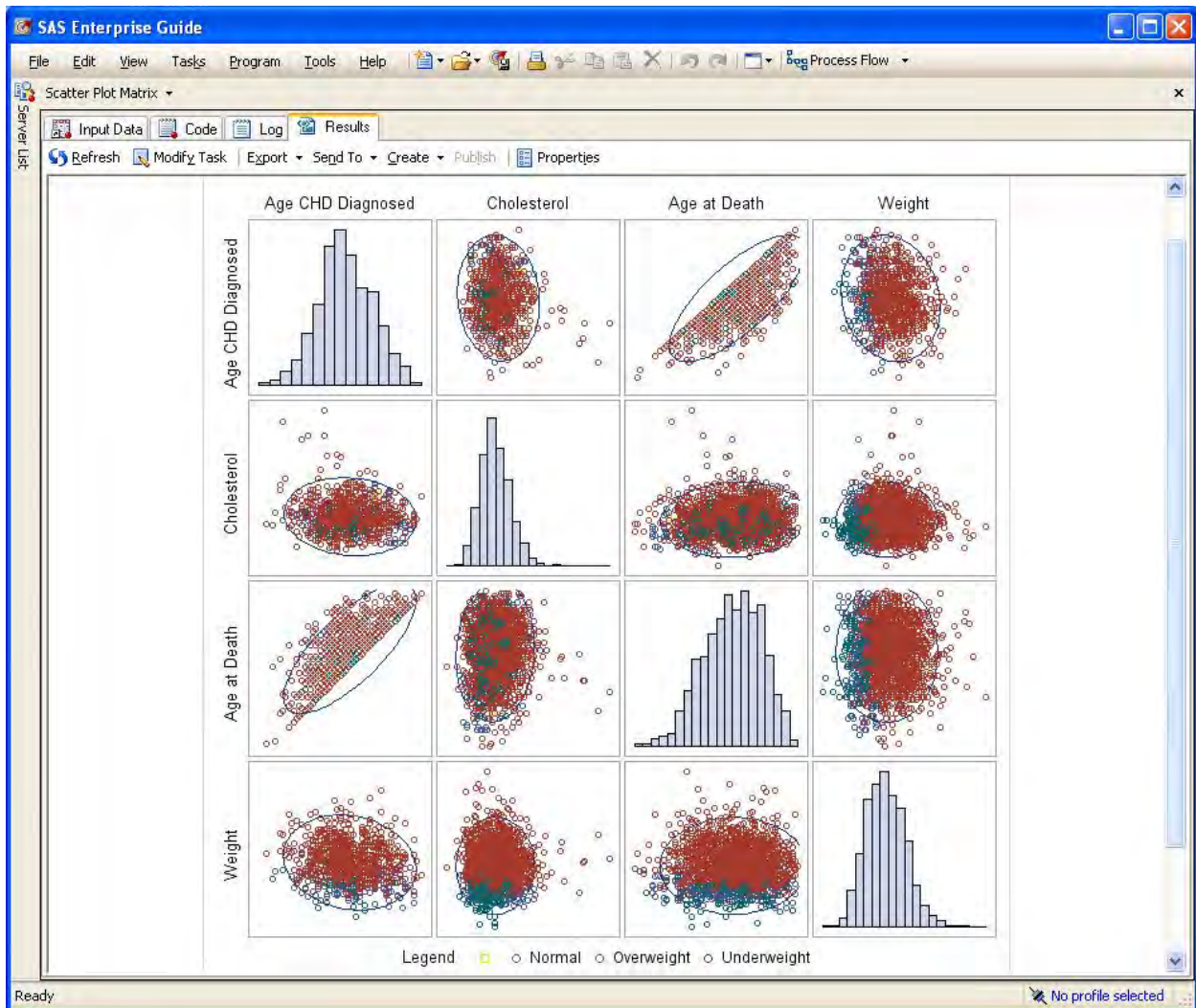


Figure 5 - Scatter Plot describing the relationships between pairs of variables

That was easy – wasn't it??

What other ways can you visualize your data in SAS Enterprise Guide?

Depending on the version you are using, there are a lot of additional Graph Tasks.



Figure 6 - Graph Tasks - choices are version dependent

Similar to Figure 5, the tasks above provide you with a variety of selections to specify your choices for data, variables, options, output customization, and more.

VERTICAL BAR CHART

Perhaps you would like to use a simple vertical bar chart to describe your data, but you are not familiar with the SAS/GRAPH code you would need? Let SAS write the code for you!

- Select **Tasks** → **Graph** → **Bar Chart** from the main menu. This opens the Bar Chart Wizard.
- In the **Bar Chart** screen, double click on **Simple Vertical Bar**
- In the **Task Roles** screen (accessible by selecting **Data** (second item in far left):
 - change the Data source, by selecting
 - **Edit** (upper right of window)
 - **Browse** and then choose **Local** → **Libraries** → **SASHELP** → **Shoes** → **OK**

- Drag **Region** to **Column to Chart**
- Drag **Sales** to **Sum of**.
- In the **Appearance → Layout Screen**, uncheck the **2D box** and then change the **Shape** to **Prism** from the drop down list
- In the **Titles** screen
 - Click on **Graph**
 - Uncheck **Use Default Text** and enter your own title for your graph.
- To see what code was generated, click on **Preview Code**.
- Close the **Code Preview Window**
- Click on **Run** to create the Bar Chart
- The bar chart opens automatically in a new Tab in your Enterprise Guide session.

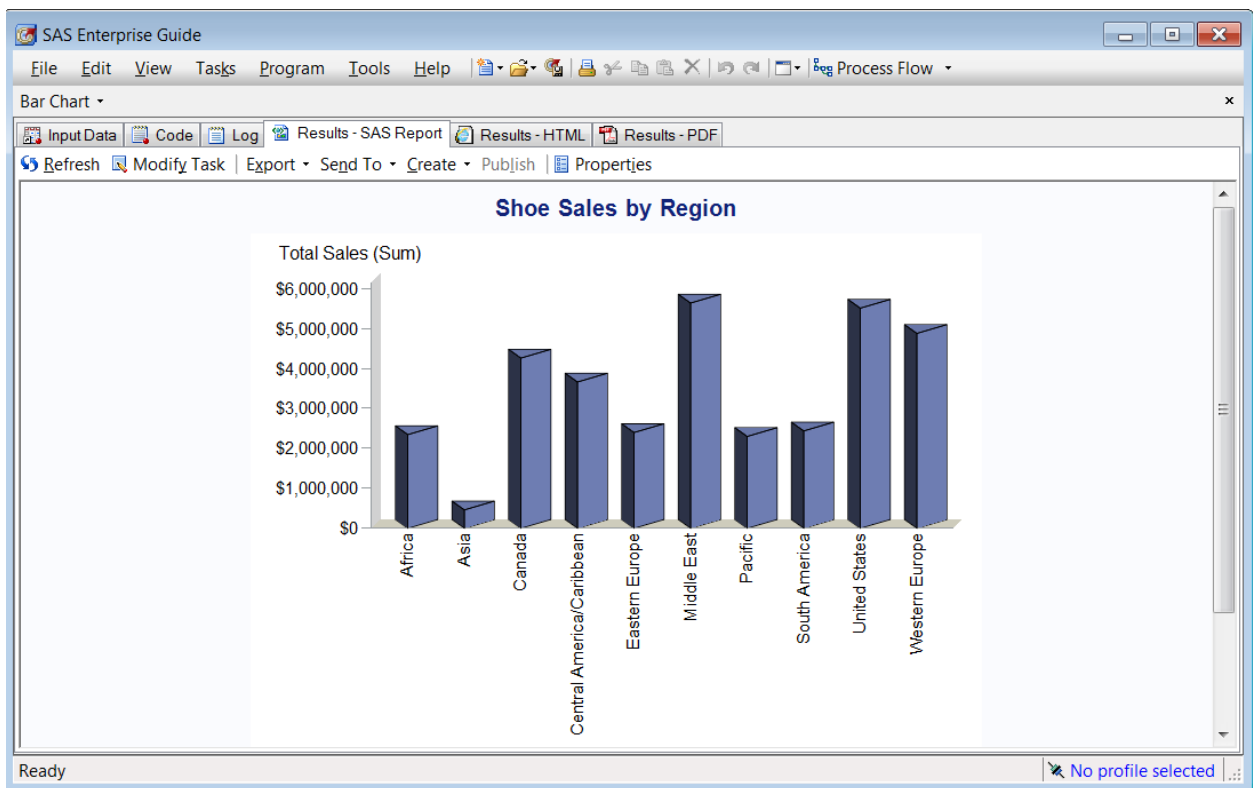


Figure 7 Vertical Bar Chart - Notice tabs that are available

In addition to viewing the Bar Chart, notice that there are also tabs for the **input data**, **code**, and **log**. Additionally, the Context Menu allows you to easily **Modify Task** if you have changes to make.

The Code tab displays the program that was created to produce the Bar Chart, and there are many visual cues to help with code readability and understanding.

- Code coloration helps you view possible code issues (try removing a semicolon or quote and watch the color adjust)
- SAS Documentation displays when you hover your mouse over keywords (Figure 9).

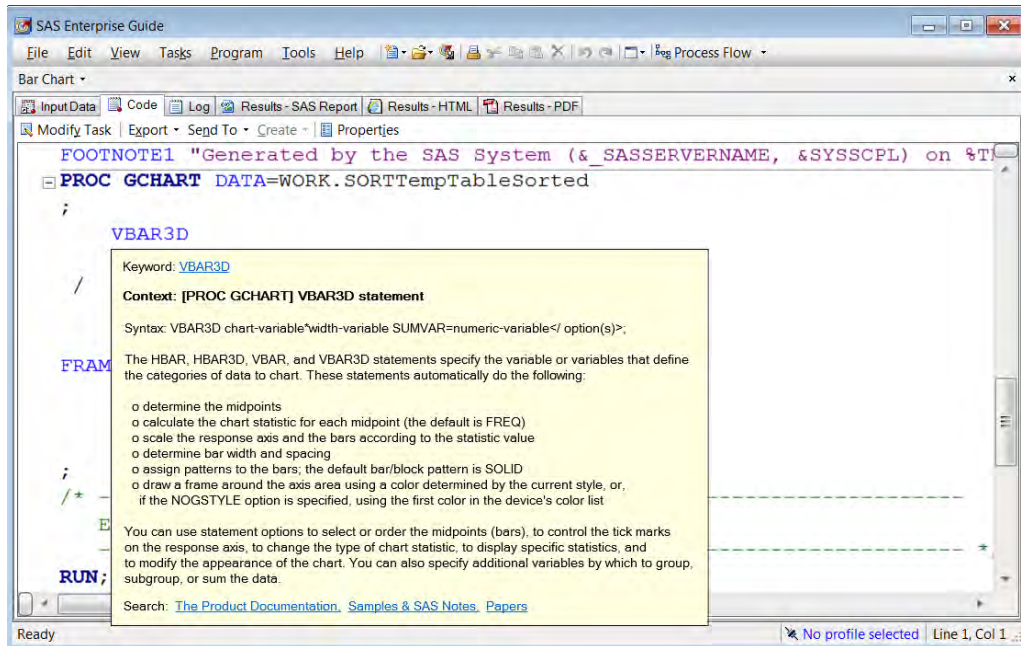
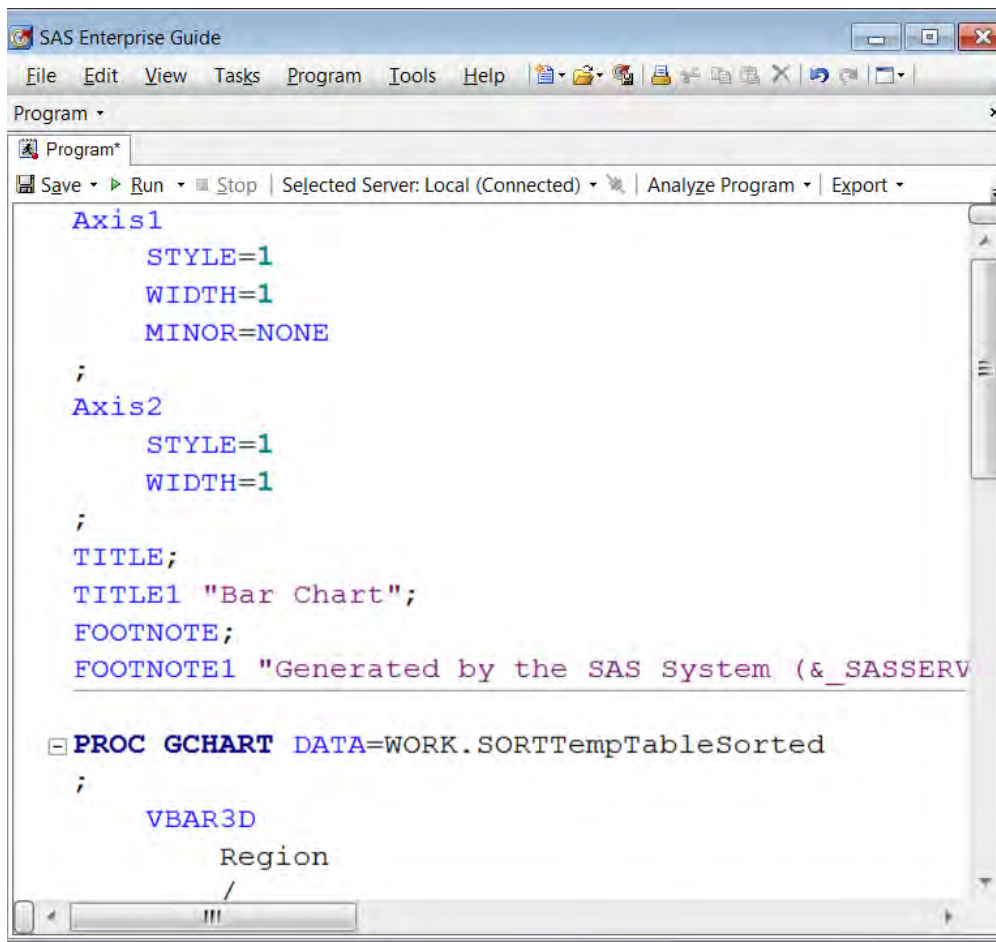


Figure 8 Documentation Displays Easily

TASKS ARE FUN, BUT LET'S BORROW THE CODE AND MAKE CHANGES

If you would like to copy this code as a starting point for your programs, you can save the generated code, and then make modifications.

- Select the code tab (see figure 9)
- Select the **AXIS**, **GOPTIONS**, **TITLE**, and **FOOTNOTE** statements and the **PROC GCHART** statements up to the **RUN;** statement
- Right click anywhere in the highlighted code, and select **Copy**
- Select **File → New → Program**
- Paste the copied code into the new (empty) Program Tab (Figure 10).



```
Axis1
  STYLE=1
  WIDTH=1
  MINOR=NONE
;
Axis2
  STYLE=1
  WIDTH=1
;
TITLE;
TITLE1 "Bar Chart";
FOOTNOTE;
FOOTNOTE1 "Generated by the SAS System (&_SASSERV

PROC GCHART DATA=WORK.SORTTempTableSorted
;
  VBAR3D
    Region
```

Figure 9 Creating a New Program

PRODUCTIVITY TIPS FOR PROGRAMMING IN ENTERPRISE GUIDE

A few pointers about working with a Program in Enterprise Guide:

- Notice the * in the Program Tab above; it is a reminder to save the most recent changes.
- To Save your program, select the **Save** down arrow, and select Save As. Specify a name and location for your program. The * will disappear and the program name will appear above the tab.
- Code generated by Tasks normally creates a temporary view of your data. In Figure 10, notice PROC GCHART uses WORK.SORTTempTableSorted. Update the dataset name when creating your own program.
- Many productivity tools are available for programmers including:
 - Code completion (see figure 11) for Data Set Name completion
 - Parentheses matching
 - Syntax suggestions.

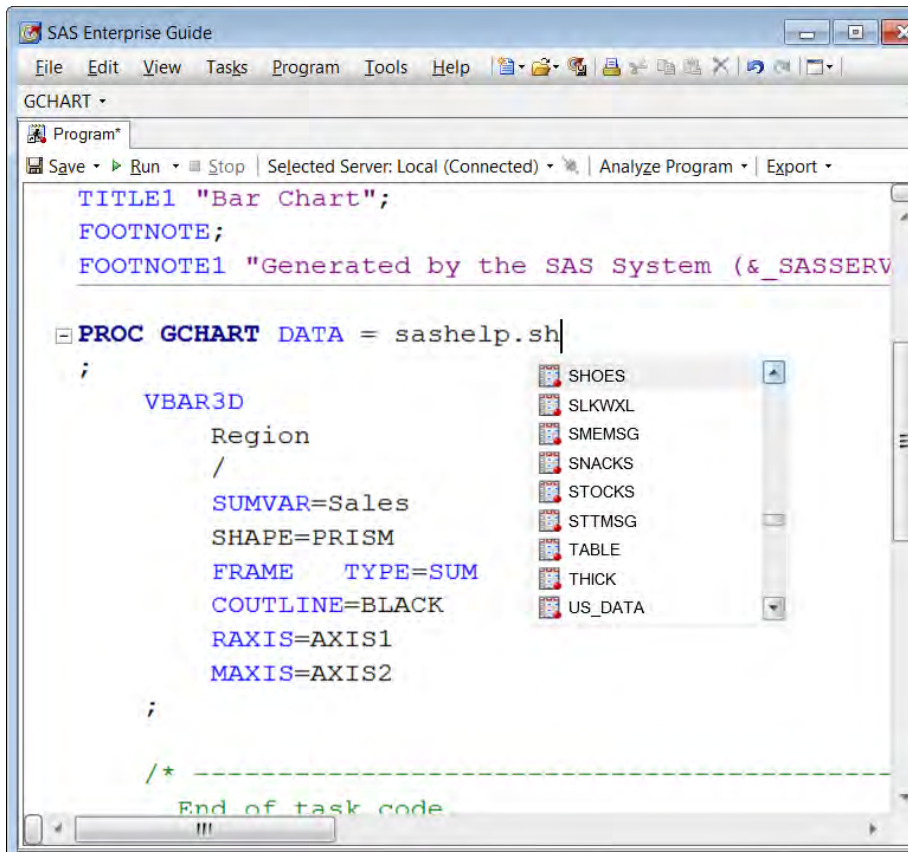


Figure 10 Code Completion - for Libraries and Data Set Names

- Have you ever inherited poorly formatted code? If your code lacks indentation, white space, and readable formatting, let Enterprise Guide fix it for you. **Right Click** and select **Format Code**.

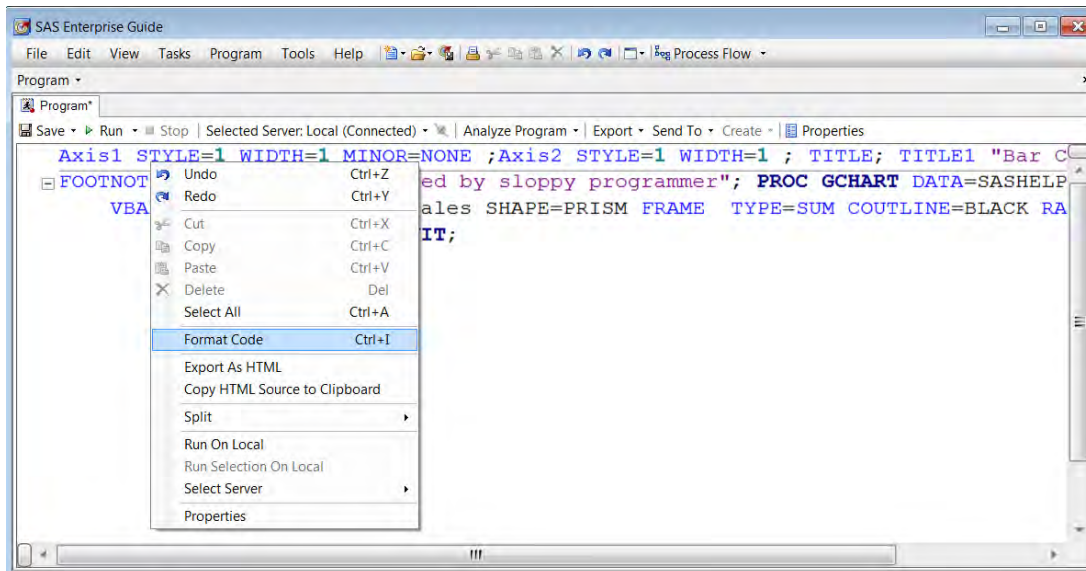


Figure 11 Poorly Formatted code - how to fix?

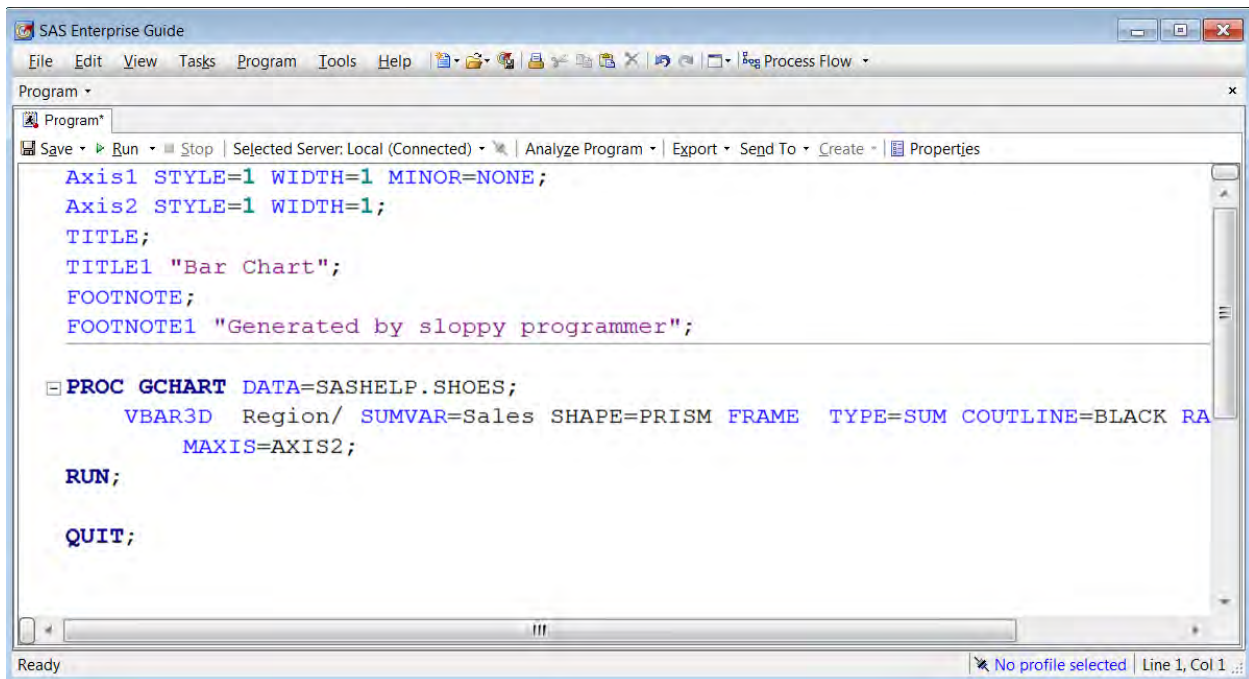


Figure 12 Nicely formatted code - thanks to Enterprise Guide

How do you adjust how the editor features work, or turn them off?

Tools → Options → SAS Program → Editor Options. Select the **Autocomplete** Tab to change how the autocomplete features work or the **Indenter** tab to change formatting features.

How can I view multiple components of my project at the same time?

Would you like to be able to view your PROGRAM at the same time you are viewing your BAR CHART? I often find it helpful to understand how the options and statements control output components by viewing the program alongside the graph. Enterprise Guide provides many ways to change your workspace layout, including:

- **View → Workspace Layout → Side by Side** (Figures 14 and 15)

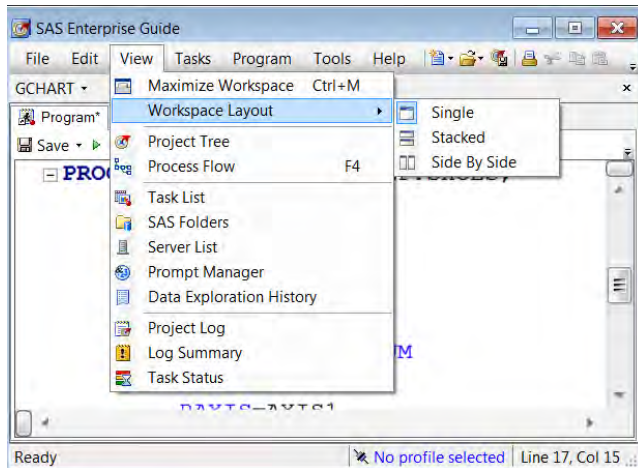


Figure 13 Workspace Layout

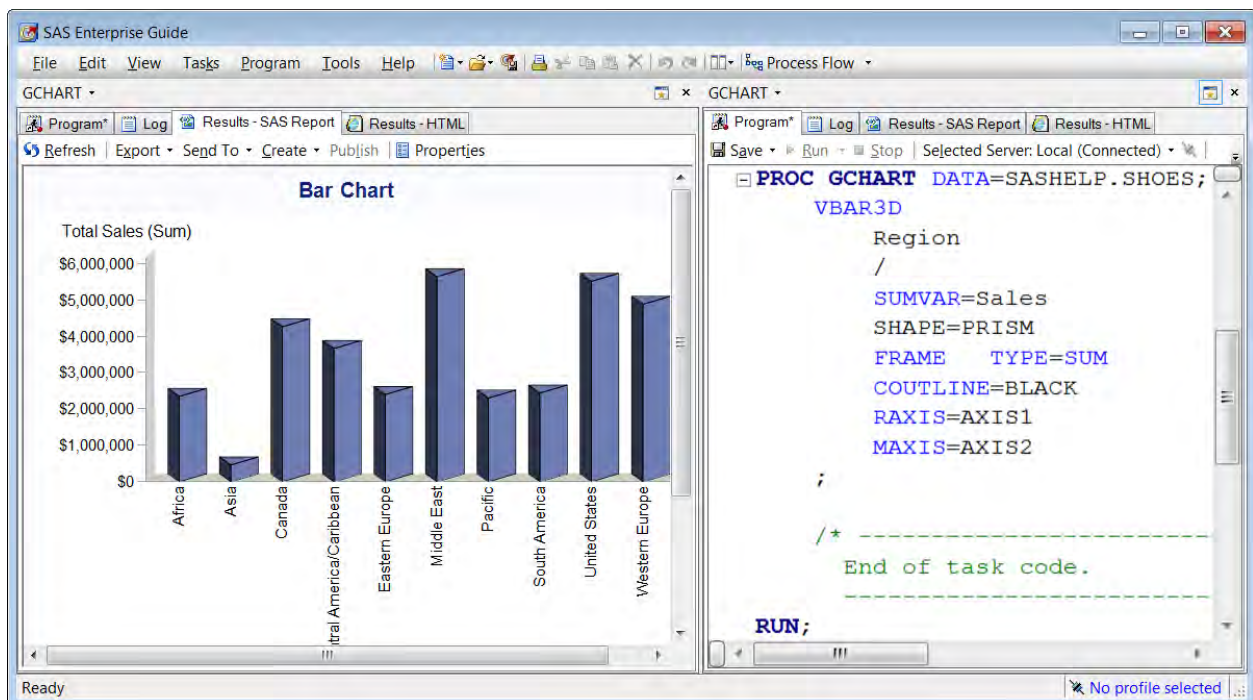


Figure 14 Side By Side view of Chart and Program

- You may find it useful to view two sections of the SAME program, side by side. To accomplish that, right click in your program and select **Split** – to be able to view two parts of the SAME program

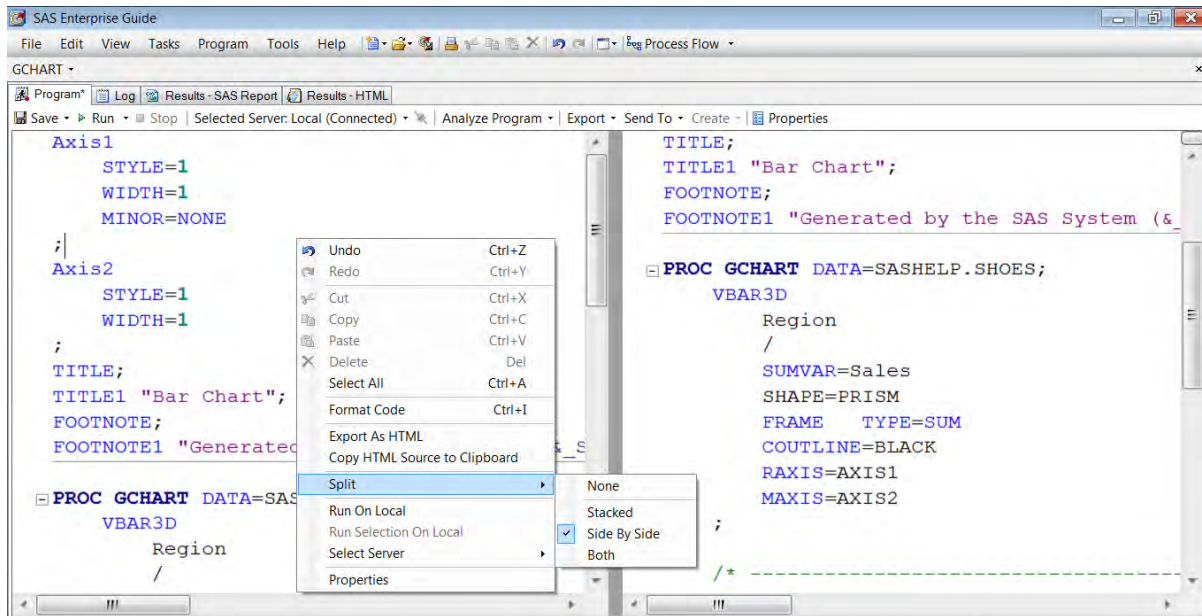


Figure 15 Viewing the top and bottom of a program at the same time

What about version control, for my programs?

SAS implemented standard source control management into Enterprise Guide 7.1.

- Curious about what changes you, or someone else has made in your program? You can
 - view Program History.
 - choose which programs to compare or commit.
- Integrate with a GIT repository

For a detailed explanation, see <http://sasgf16.v.sas.com/detail/video/4854845621001/sas-tech-talk:-latest-features-for-sas-enterprise-guide-7.1?autoStart=true> .

How can I see what macro variables are in my environment, and what their values are?

Use the new **Macro Variable Viewer!**

Tools → SAS Macro Variable Viewer

PROCESS FLOW – WHAT IS IT AND WHY DO I CARE?

As you continue using tasks to build your story, SAS Enterprise Guide keeps tracks of the steps, and your results in a **process flow**. This process Flow can be saved as an Enterprise Guide **Project** so that you can

- Easily document the steps you took
- Use the Project as a starting point later to continue with the current analysis, or, apply the flow to other data
- Share your project with other team members for their use.

To view your Process Flow, select **View → Process Flow**. Figure 17 shows an example Process Flow produced by the steps taken on the HEART data in this paper.

To save this as a project, select **Save → Project as**. This will create a file of type **EGP** which can be shared or serve as your starting point in your next session.

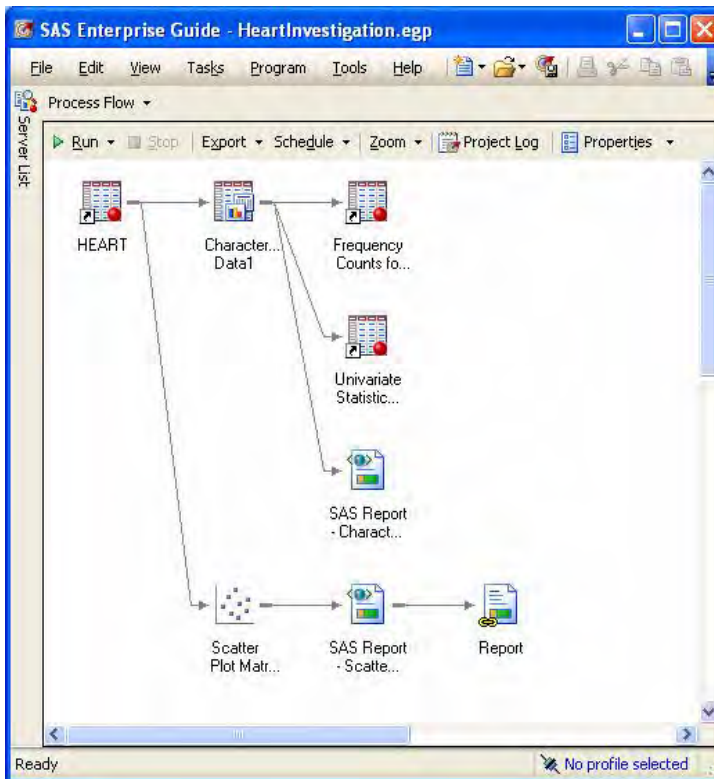


Figure 16 - Process Flow - 2 tasks and their results, using the HEART data

Additionally, you can create **Project Prompts** to generalize the project so that you can customize future results by changing data set names, time frames, variables, options, etc.

PRESENTING THE RESULTS

A challenge we all face is getting our results into a presentable format. SAS Enterprise Guide provides a variety of output formats for viewing or saving the results of tasks, as well as an excellent tool to pull results together into a single report template.

Most results within Enterprise Guide can be:

- Exported to HTML, XML, or PDF - select **Export**
- Sent to WORD, EXCEL, PPT - select **Send To**
- Saved as a report in the Enterprise Guide environment. - select **Create**.

You can also use **Tools → Options → Results** to

- control the format of all results that you produce
- customize the formats and properties of the different result formats.

If you would like to use Enterprise Guide to assemble multiple pictures and tables into a single location, select **File → New → Report**, select the reports from those you have created, and begin assembling your report. You can even bring in images such as company logos or pictures that support the data.

CONCLUSION

SAS Enterprise Guide provides a powerful and flexible environment to let you focus your time and energies on finding and delivering actionable insights for effective decision making. Instead of learning and writing SAS programs, you can explore the built-in tasks and capabilities to fulfill your reporting and analytics needs.

RECOMMENDED READING

For additional SAS® Enterprise Guide® presentations and explanations, please see

- http://www.sascommunity.org/wiki/Presentations:Marje_Papers_and_Presentations
- <http://blogs.sas.com/content/sasdummy/2014/02/17/favorite-eg-tricks-fecht/>
- <http://blogs.sas.com/content/sasdummy/2014/07/09/performance-tips-sas-eg-datagrid/>
- <https://blogs.sas.com/content/sasdummy/2017/08/18/debug-program-history/>
- <https://www.sas.com/content/dam/SAS/support/en/technical-papers/SAS0637-2017.pdf>
- Join the Enterprise Guide Community, and other communities at communities.sas.com

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

Marje Fecht

Prowerk Consulting

marje.fecht@prowerk.com

www.prowerk.com

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration.

Other brand and product names are trademarks of their respective companies.