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Using the ODS EXCEL Destination with SAS® University Edition to Send Graphs to Excel

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ABSTRACT

Students now have access to a SAS® learning tool called SAS® University Edition. This online tool is freely available to all, for non-commercial use. This means it is basically a free version of SAS that can be used to teach yourself or someone else how to use SAS. Since a large part of my body of writings has focused upon moving data between SAS and Microsoft Excel, I thought I would take some time to highlight the tasks that permit movement of data between SAS and Excel using SAS University Edition. This paper is directed toward sending graphs to Excel using the new ODS EXCEL destination software.

INTRODUCTION

The new ODS Excel Destination allows the direct output of SAS produced data to Excel workbook files in the new *.xlsx format. This feature of SAS is available to anyone using the third maintenance release of SAS 9.4 or greater as the base product, including SAS University Edition®. SAS University Edition has features that allow you to create graphs with little or no effort. The proper output commands will allow you to send SAS outputs directly to Excel workbooks. All of the options and sub-options of the ODS Excel Destination are available. This paper will show you how to send graphs to Excel. Since the SAS University Edition is not for commercial use I expect this paper to help students enhance their school work. SAS Studio® is the base SAS product, and these commands with the proper changes for directory references are useful there too (they work in SAS Studio the same way).

PROBLEM

The ability to directly write graphs to Excel workbooks has long been something that has not been available with the EXCELXP tagset. Additionally, customizing the workbook has often been hard to accomplish. The SAS display manager and SAS Enterprise Guide both have menu and task bar entries that allow outputting data to an Excel file of one form or another, but I have not seen a similar menu driven method for writing data out to an Excel workbook using SAS University Edition. While options do exist as menu driven items in SAS University Edition to import Excel workbooks. The new options and capabilities of the ODS EXCEL destination will allow and simplify the customization of your output Excel workbooks using SAS University Edition software.

INSTALLING SAS UNIVERSITY EDITION SOFTWARE

The SAS University Edition software is provided free by SAS to be used as a training tool. Most commonly it is used by students to learn how to use the SAS software. Specifically, the software is the SAS Studio software and it is used in a virtual setting. The SAS University Edition software does not reside on the user's computer and is not intended for commercial usage. I do not have the space to describe how to install the software, or the virtualization software required to execute the software. However, this link will take you to the SAS web site to access this tool.

https://www.sas.com/en_us/software/university-edition.html Before you can use the tool you need to install either Oracle VirtualBox, or VMware Workstation Player virtualization software. The SAS web site gives you full details about how to install either of these software packages and provides information about the usage.

ODS EXCEL DESTINATION COMMAND DESCRIPTIONS

All ODS commands are described in the SAS online manual "SAS® 9.4 Output Delivery System: User's Guide, Fifth Edition" including the commands that relate to the EXCEL destination. I found a copy at the following SAS web site:

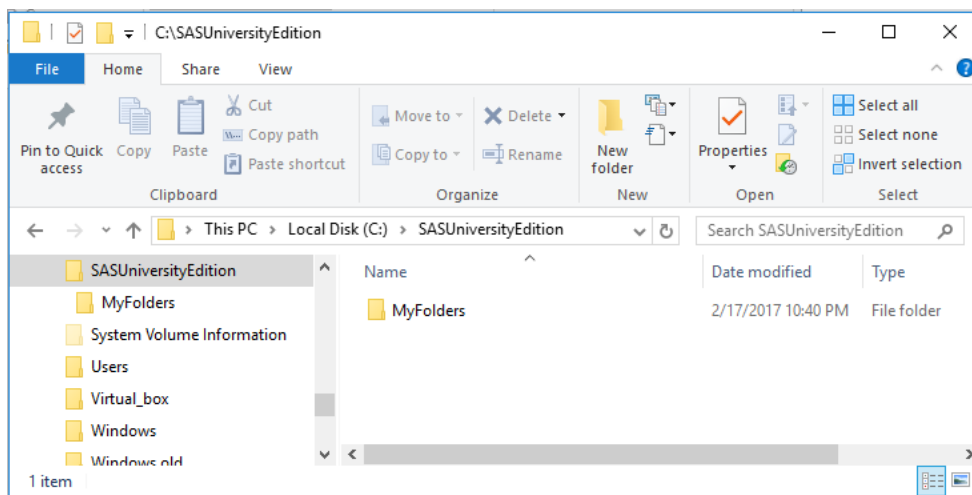
<http://support.sas.com/documentation/cdl/en/odsug/69832/PDF/default/odsug.pdf>. In addition, as part of BASE SAS the ODS EXCEL destination also works on at least some "NON-Windows" based computer

systems. See the SAS documentation to see which platforms are available. One system is the z/OS operating system that is usually found on IBM mainframes. This Excel destination works when using HFS files and directories, See the manual for more information. Pages 292 to 320 of the SAS® 9.4 Output Delivery System: User's Guide manual to describe the ODS EXCEL Statement

GETTING STARTED

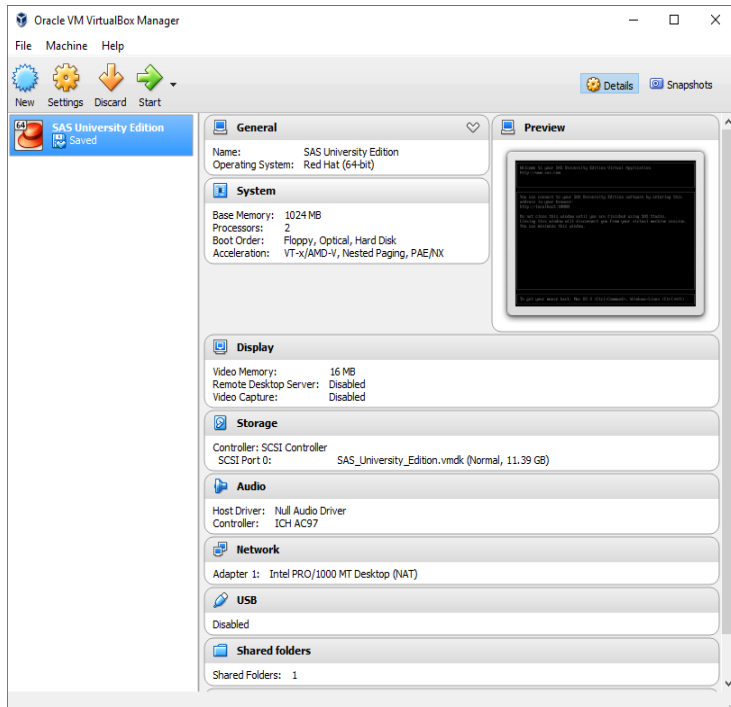
Getting started is always the hardest part of a project. Once you have the virtualization software (a virtual machine) and SAS University Edition software links installed you will find out you have to start the virtual machine first and then link to the SAS University Edition software with your browser. But before you start you will need to create a directory called "SASUniversityEdition" in a location where you can write data into a directory called "MyFolders" so that the tool will have an output location on your system to place data.

Figure 1 – The SAS University Edition Output Directory.



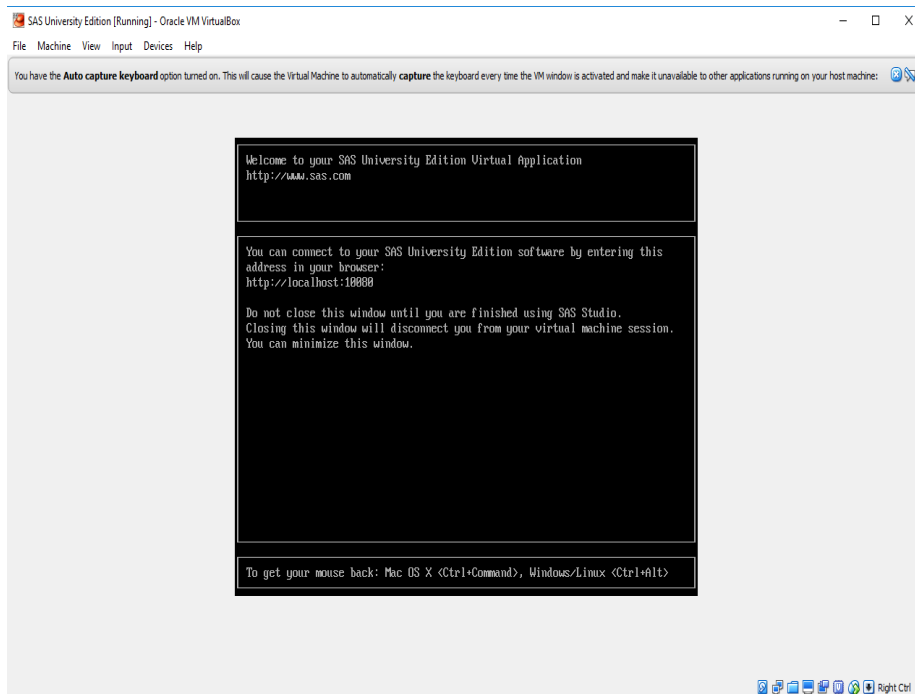
My software and the version you see, may look different but the concept is the same. I like to link the shortcut to the taskbar so I can be reminded of where it is, and how to start it with one click of the mouse. When I click on the icon to start the virtual machine I get a screen that looks similar to the figure 2, yours may be different.

Figure 2. Start-up screen for the Oracle VM VirtualBox Manager.



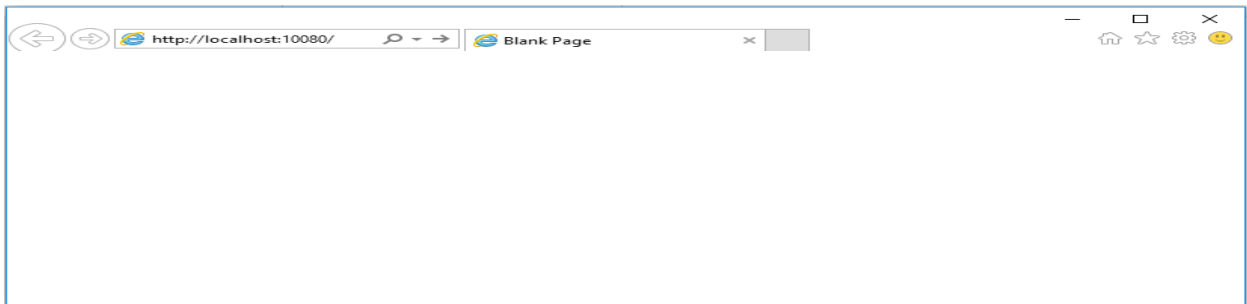
You will need to click on the green START button and select the appropriate action to get the virtual machine running. When it does start, you will see a screen similar to Figure 3. The information on this screen will tell you the web address of the SAS University Edition that you need to enter into your browser. Here it is shown as <http://localhost:10080>.

Figure 3. Oracle VM VirtualBox introduction Screen for SAS University Edition.



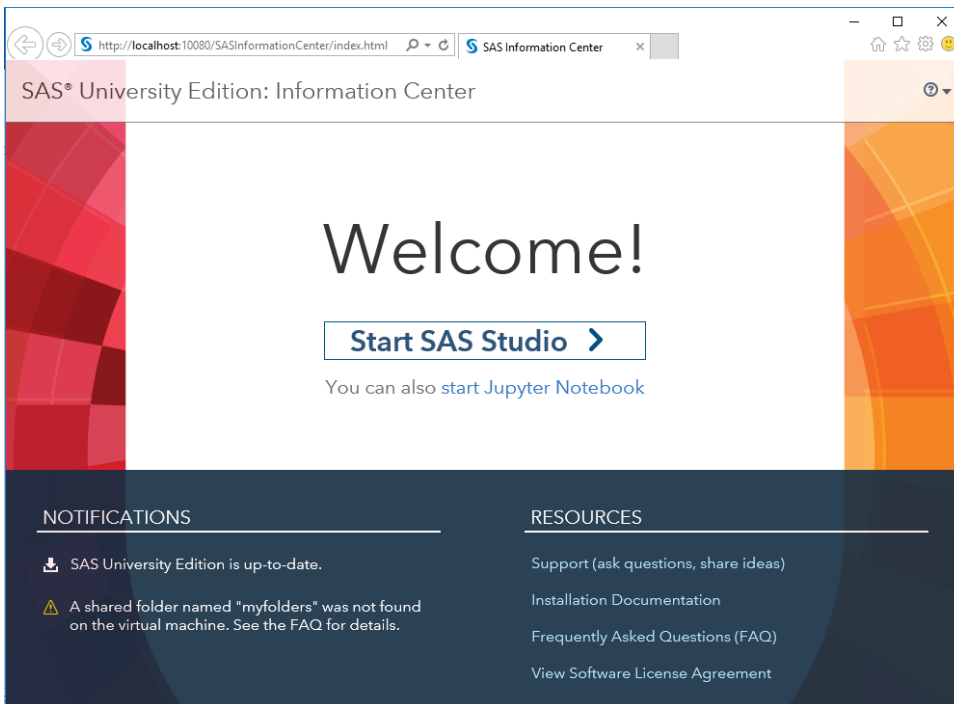
Make sure that you use the address provided by the SAS University Edition you are using, just in case it is different from the one displayed here.

Figure 4 – WEB Browser for starting the SAS University Edition software.



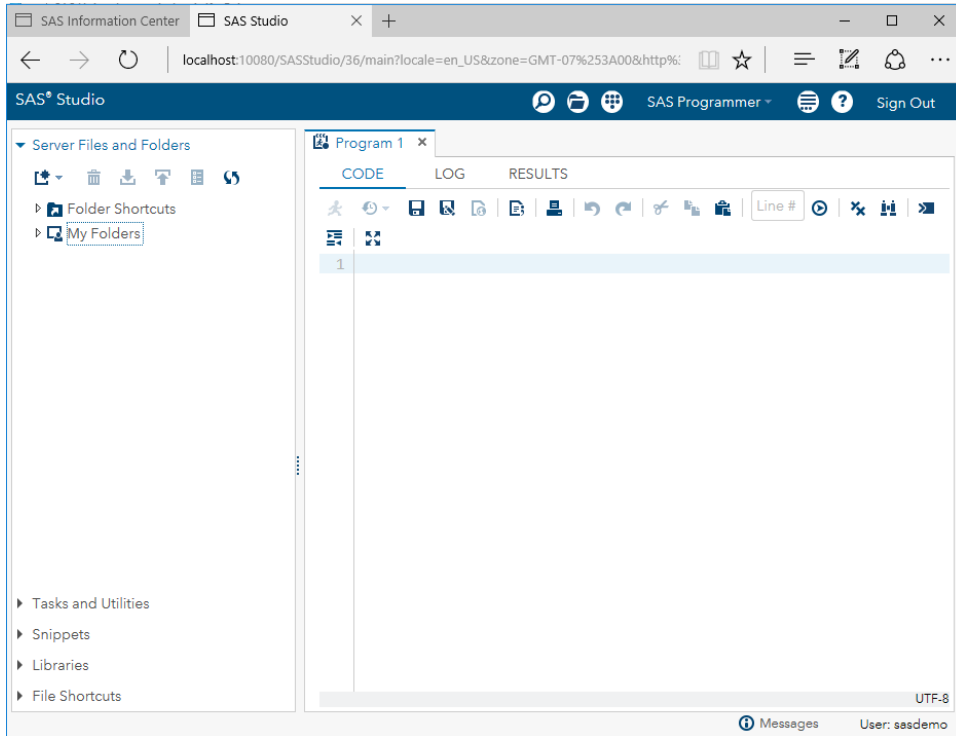
The next screen shot is the SAS web page that actually starts the SAS University Edition software. Pressing the “Start SAS Studio” button will launch SAS University Edition.

Figure 5 – The SAS University Edition Start screen.



The screen shown in Figure 6 is the primary desktop screen for entering code to be executed by the SAS University Edition Software. You can type or paste code here, you can even include code from the directories known to your session.

Figure 6 – Your Browser Screen Showing the Primary SAS Studio Desktop Screen.




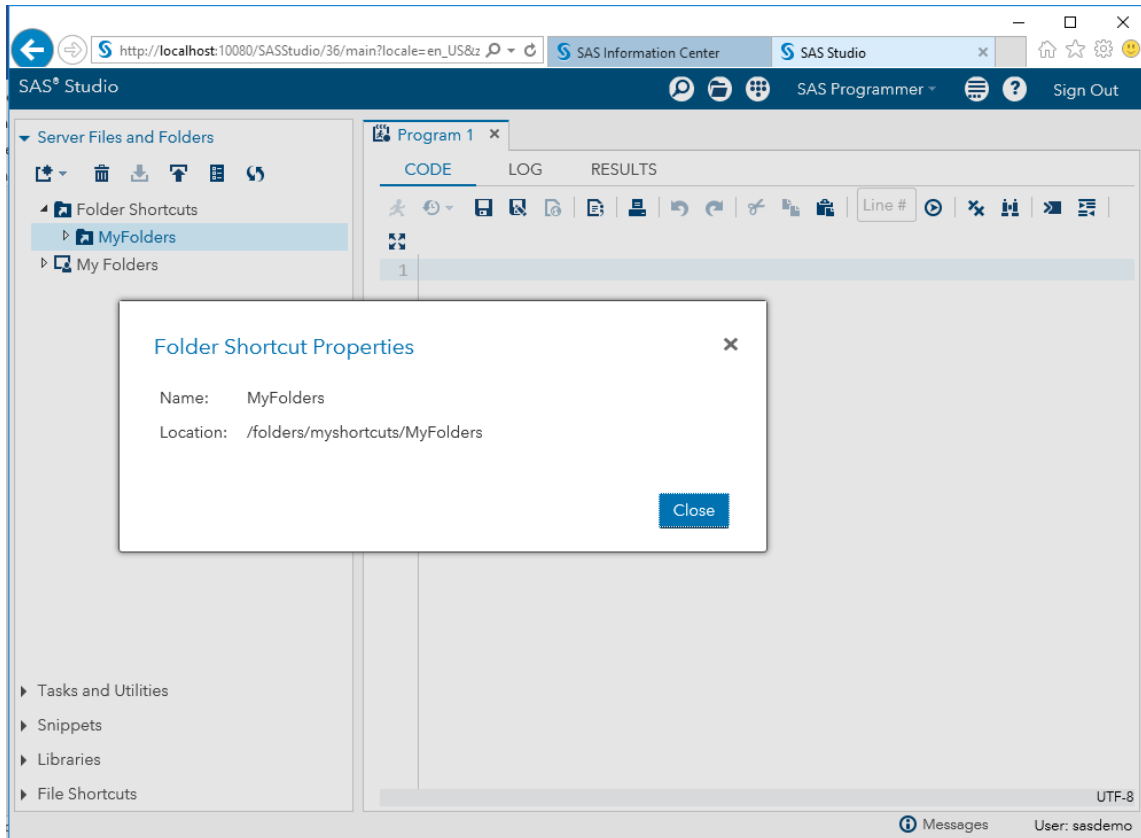
The screen in Figure 6 shows two entries under the “Server Files and Folders” arrow called “Folder Shortcuts” and “My Folders”. By right clicking on either of these entries we can identify the path known to SAS University Edition of the directory on your system. We will only focus on the “Folders and Shortcuts” entry, it is the directory we created above for the SAS University Edition software. This folder is a known location on your system. But to reference it within SAS Code we use we need to know the shortcut properties known to SAS University Edition. We can either right click on the “MyFolders” label or click the  icon to show the properties. When defining an ODS “FILE=” clause we need to use the location listed, in this case “/folders/myshortcuts/MyFolders”. Notice here that there is no computer specific drive or direct file path.

Figure 7 – The Properties for the MyFolders directory location.



After you have identified the properties of the output path you can insert that information into the ODS EXCEL Destination command as part of the “File” path for the output Excel workbook, as shown in the SAS CODE 1 text box below. The actual file name *.xlsx can be anything you choose. Enclosing the file name in double quotes will allow the use of a SAS macro variable as part of the path/filename. The ODS Excel Destination commands only write Excel files formatted in the *.xlsx output format.

SAS Code 1: ODS EXCEL Destination code to write output to an Excel Workbook.

```
ods excel file = '/folders/myshortcuts/MyFolders/Excel_File_on_my_disk.xlsx' style=Harvest;
proc print data=sashelp.shoes(where=(region="Asia"));
  by region;
run;
ods excel close;
```

Notice that I used the SAS Style=Harvest option of the ODS Excel Destination statement to add some color to the output Excel workbook.

Figure 8 – The Output Log generated by the SAS code in SAS CODE 1.

```

CODE    LOG    RESULTS
┌───┬───┬───┐
│   │   │   │
├───┴───┴───┘
└─ Errors, Warnings, Notes ─┘

1      OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
NOTE: ODS statements in the SAS Studio environment may disable some output features.
62
63      ods excel file = '/folders/myshortcuts/MyFolders/Excel_File_on_my_disk.xlsx' style=Harvest;
64      proc print data=sashelp.shoes(where=(region="Asia"));
65      by region;
66      run;

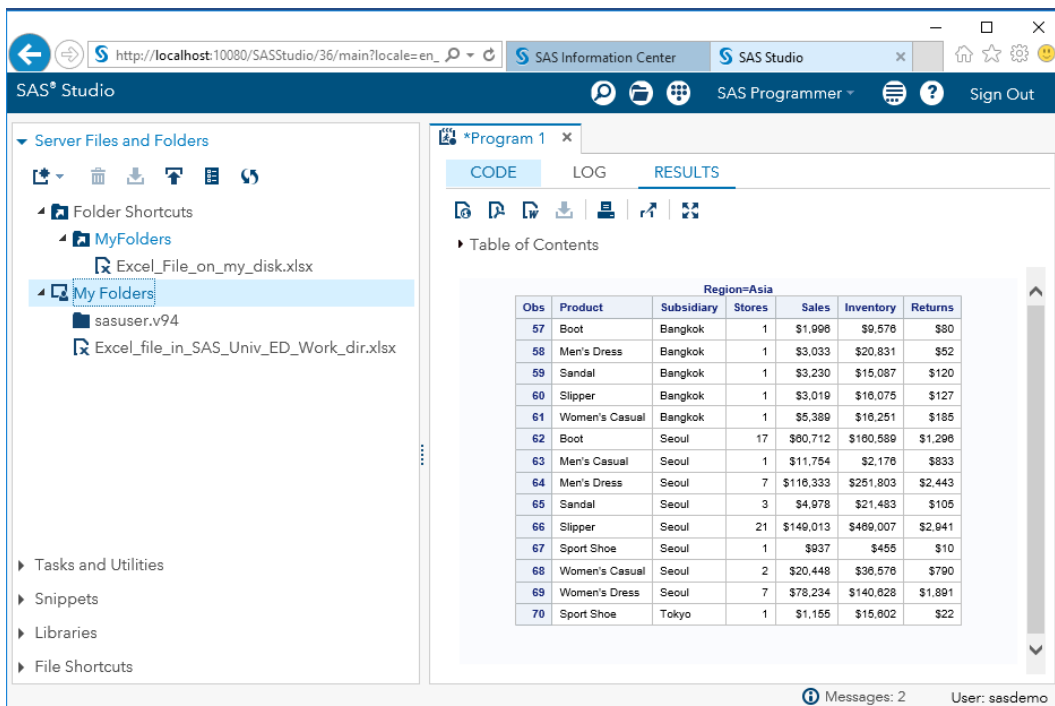
NOTE: There were 14 observations read from the data set SASHELP.SHOES.
      WHERE region='Asia';
NOTE: PROCEDURE PRINT used (Total process time):
      real time          0.15 seconds
      cpu time           0.12 seconds

67      ods excel close;
NOTE: Writing EXCEL file: /folders/myshortcuts/MyFolders/Excel_File_on_my_disk.xlsx
68
69
70
71      OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
84

```

As with any software system that generates code for you, the SAS University Edition wants to be in complete control. Therefore, the SAS Note about ODS statements in the SAS Studio environment may disable some output features appears when you add the ODS commands. It is my understanding that the ODS Excel options work well with the SAS University Edition software, but I have not tried all of the options and therefore this note could take on new meaning if something goes haywire, so beware of how you use the options.

Figure 9 – The Results window presented after the code in SAS CODE 1 executed.



The results shown in Figure 9 are the output SAS generated for display within the SAS environment, and do not reflect the way the output is displayed in an Excel workbook.

Figure 10 – Excel output generated by the code in the SAS CODE 1 text.

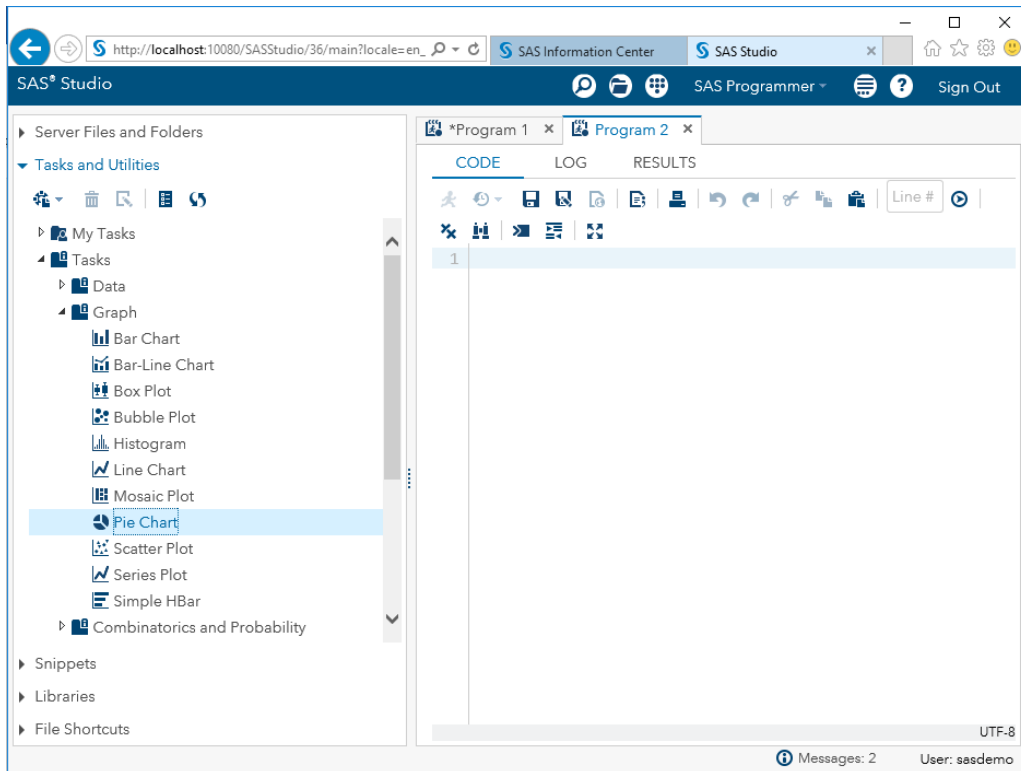
Region=Asia						
Obs	Product	Subsidiary	Stores	Sales	Inventory	Returns
57	Boot	Bangkok	1	\$1,996	\$3,576	\$80
58	Men's Dress	Bangkok	1	\$3,033	\$20,831	\$52
59	Sandal	Bangkok	1	\$3,230	\$15,087	\$120
60	Slipper	Bangkok	1	\$3,019	\$16,075	\$127
61	Women's Casual	Bangkok	1	\$5,389	\$16,251	\$185
62	Boot	Seoul	17	\$60,712	\$160,589	\$1,296
63	Men's Casual	Seoul	1	\$11,754	\$2,176	\$833
64	Men's Dress	Seoul	7	\$116,333	\$251,803	\$2,443
65	Sandal	Seoul	3	\$4,978	\$21,483	\$105
66	Slipper	Seoul	21	\$149,013	\$469,007	\$2,941
67	Sport Shoe	Seoul	1	\$937	\$455	\$10
68	Women's Casual	Seoul	2	\$20,448	\$36,576	\$790
69	Women's Dress	Seoul	7	\$78,234	\$140,628	\$1,891
70	Sport Shoe	Tokyo	1	\$1,155	\$15,602	\$22

The output in Figure 10 shows the full amount of the data selected with the “Where” clause from the SASHELP dataset called “Shoes” with the SAS Style named “Harvest” applied to the output Excel display. The “Harvest” style sheet is one of many SAS supported styles that can be applied by name to the output. I also used a “BY” statement to get a centered title “Region=Asia” at the top of the sheet.

As I mentioned before the SAS University Edition likes to be in control and gives you many options to create your own outputs. For instance, you can choose to make a graph by using the tools provided by

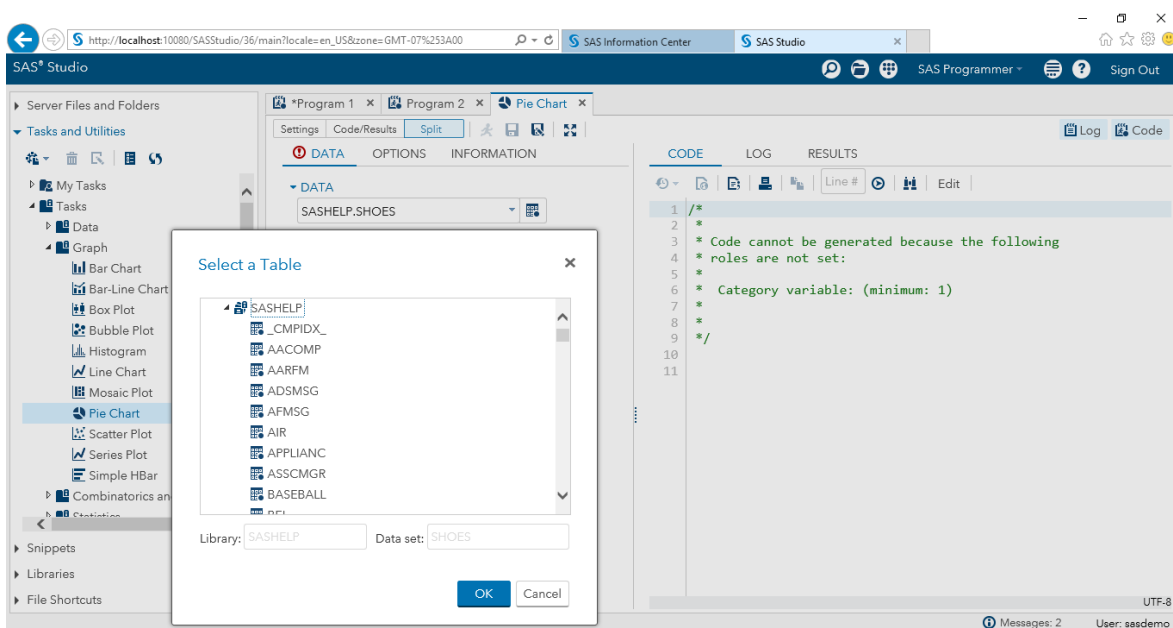
the system. But sending that graph to Excel is not as easy, because I could not find an easy menu driven method of outputting data to Excel.

Figure 11 – Where to Locate the “Pie Chart” Utility.



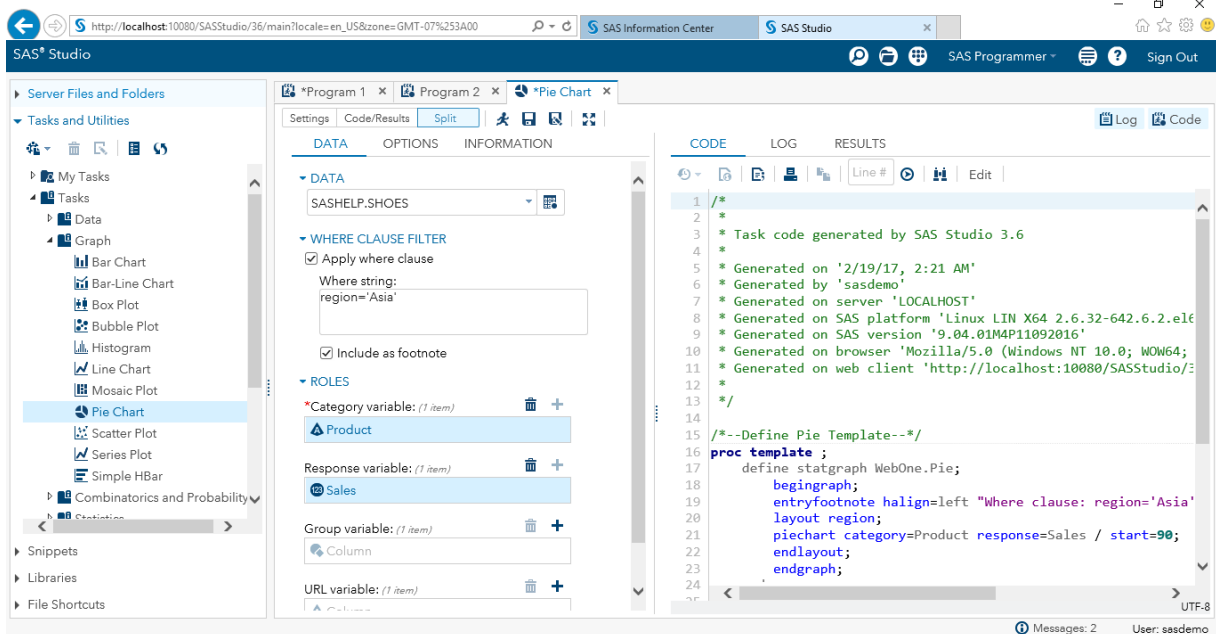
Once you select a graph you then need to select the data. Again, the data has to come from a location known to the SAS University Edition “Server Files and Folders” locations for the system to read the data.

Figure 12 – Selecting a SAS Data Set for Input.



Notice that the Code Window indicates that no graph can be generated yet because you have not established any “Roles” form the data to project onto the graph. The next figure, Figure 13, shows how you can provide the needed information. I included a where clause to restrict the data used for the pie chart.

Figure 13 – Pie Chart Feature Selection Window and Generated SAS Code.



I could not show all of the SAS code generated in Figure 13, but I have reproduced it in the SAS Code 2 code listing. I have included the entire code unit produced by the SAS University Edition pie chart tool. Additionally, the SAS Code 2 listing also includes (in **BOLD RED**) the extra code I added to write the output of the SAS code to an Excel workbook. This code also produces the output data used to produce the pie chart that is printed in the output worksheet above the pie chart. The following is an explanation of that code.

1. “ods excel file=‘/folders/myshortcuts/MyFolders/Excel_File_with_graph and titles.xlsx’” – This declares that I want to use the SAS ODS Excel Destination statement and names the output file. Notice that the “file=” name is a location known to SAS University Edition software, specifically the “MyFolders” directory we created at the start of the paper. You cannot use a direct reference to a disk drive or a URL to reference an output location.
2. I retained the ODS Excel Destination option “STYLE=HARVEST” to add a little color to the output.
3. I added three ODS Excel Destination “sub-options” listed as part of the “OPTIONS ()” clause.
 - a. “SHEET_INTERVAL=‘NONE’” to keep all of the output information on one worksheet.
 - b. “EMBEDDED_TITLES=‘ON’” to place the titles from my SAS code into the worksheet.
 - c. “ROWBREAKS_INTERVAL=‘PROC’” to put some space between the data and the Pie chart.
4. I added a TITLE statement to be printed above the data.
5. I added the PROC PRINT code using the “BY REGION” clause to enhance the embedded titles.
6. I added a second TITLE statement to be printed above the Graph.
7. The SAS Code in black (non-bold) print was generated by the Pie Chart wizard.
8. I added the “ODS EXCEL CLOSE” statement to close and release the Excel workbook for other uses.
9. The graph that is output is an image.

SAS Code 2 – Writing a Pie Chart Graph to an Excel Workbook.

```
ods excel file = '/folders/myshortcuts/MyFolders/Excel_File_with graph and titles.xlsx'  
style=Harvest options(sheet_interval='none'  
    embedded_titles='on'  
    rowbreaks_interval='proc');  
  
title 'Data for Region Asia';  
proc print data=sashelp.shoes(where=(region="Asia"));  
    by region;  
run;  
  
/*  
*  
* Task code generated by SAS Studio 3.6  
*  
* Generated on '2/19/17, 2:21 AM'  
* Generated by 'sasdemo'  
* Generated on server 'LOCALHOST'  
* Generated on SAS platform 'Linux LIN X64 2.6.32-642.6.2.el6.x86_64'  
* Generated on SAS version '9.04.01M4P11092016'  
* Generated on browser 'Mozilla/5.0 (Windows NT 10.0; WOW64; Trident/7.0; rv:11.0) like Gecko'  
* Generated on web client 'http://localhost:10080/SASStudio/36/main?locale=en_US&zone=GMT-07%253A00'  
*  
*/  
  
title 'graph for region Asia';  
/*--Define Pie Template--*/  
proc template ;  
    define statgraph WebOne.Pie;  
        begingraph;  
        entryfootnote halign=left "Where clause: region='Asia';"  
        layout region;  
        piechart category=Product response=Sales / start=90;  
        endlayout;  
        endgraph;  
    end;  
run;  
  
/*--Set output size--*/  
ods graphics / reset imagemap;  
  
/*--SGRENDER proc statement--*/  
proc sgrender template=WebOne.Pie data=SASHELP.SHOES  
    (where=(region='Asia'));  
run;  
  
ods graphics / reset;  
ods excel close;
```

The log may output the following NOTE:

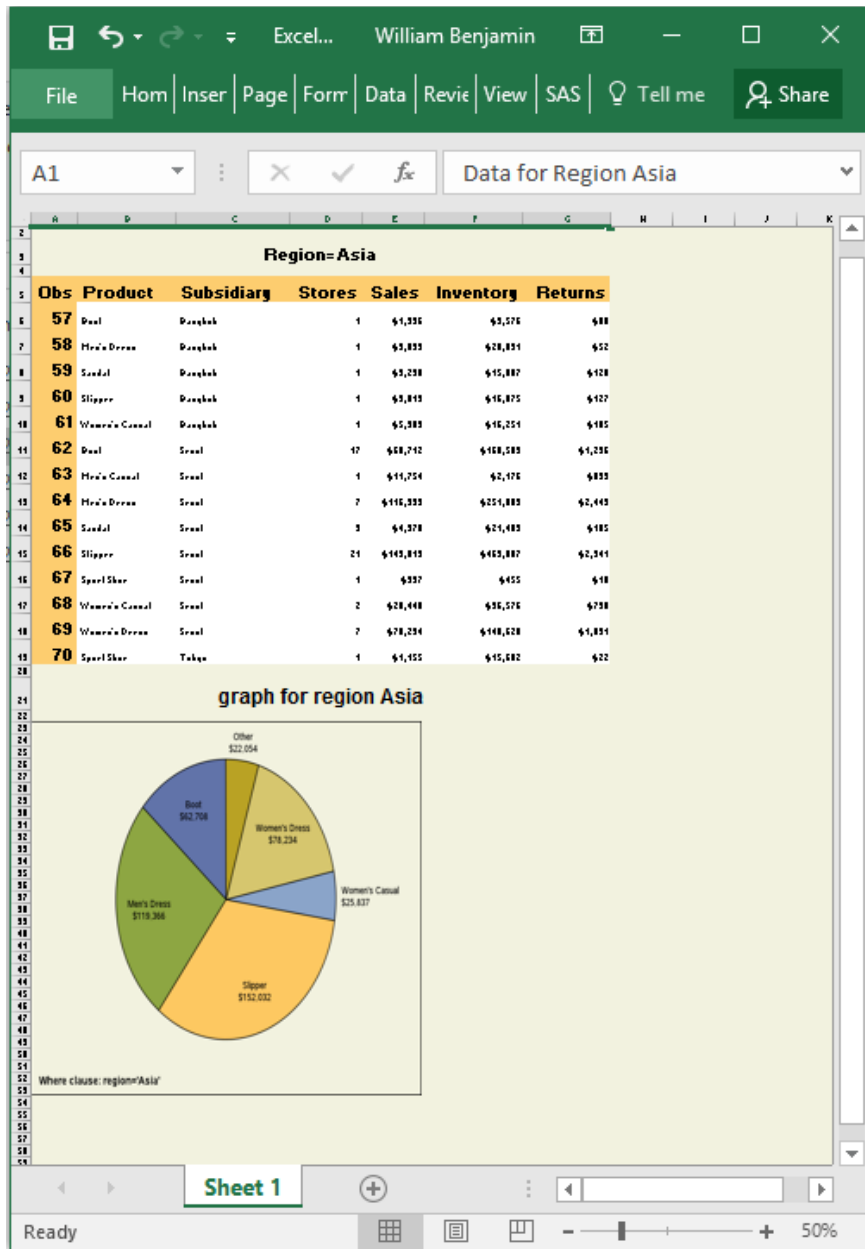
NOTE: ODS statements in the SAS Studio environment may disable some output features.

While it is true some options will disable some output features of the SAS University Edition software, it does not seem that the ODS EXCEL options had any impact of the output features.

OBSERVATIONS ABOUT SAS UNIVERSITY EDITION OUTPUTS

Figure 14 shows the final output results. Admittedly the pie chart is a rather simplistic application of a graph. But, I used reproducible code to send the graph to an Excel Workbook. Without using the SHEET_INTERVAL sub-option the data table and graph would have been on two worksheets. In fact, any data produced between the ODS EXCEL FILE... statement and the ODS EXCEL CLOSE statement would have gone to the output Excel workbook. The SAS ODS EXCEL Destination has over 75 options and sub-options available. The graph you see in Figure 14 is not an active-X enabled graph as some native Excel graphs are, but in addition to the simple graph I produced there are many other SAS graph options that can be applied to the output graphs.

Figure 14 – Output of the SAS Program producing both a data listing and a pie chart.



CONCLUSION

SAS University Edition software runs in a virtual environment. That means that the software executing on your computer is isolated from the hardware of your computer. The virtual machine is a computer program simulating another computer on your computer using a browser to interface with you to run the SAS University Edition software. It does not know anything about your computer. When running, the SAS University Edition software does not know how to find your "C:" drive directly. The location of "MyFolders" directory (C:\SASUniversityEdition\MyFolders) is maintained by the virtual machine software. This directory can be changed in the settings of the virtual machine, but is not typically done. When I was writing this paper, I looked for ways to use a Uniform Resource Locator (URL) to point to a location on one of my drives, with no success I might add. The ability to write directly to the MyFolders directory without using output tabs and windows greatly simplifies the output process.

The SAS University Edition free software package is a great tool for learning how to use the SAS Studio software. It also gives you access to the basic SAS commands because you can write your own code. But, remember it is a teaching tool, not for commercial use. But if you can get students using your software in school, they might want to use it at work too.

REFERENCES

SAS Institute Inc. 2016. SAS® 9.4 Output Delivery System: User's Guide, Fifth Edition. Cary, NC: SAS Institute Inc.

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