Paper 780-2017

Using the Power of SAS® from JMP

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ABSTRACT

JMP® integrates very nicely with SAS® software, so you can do some pretty amazing things by combining the power of JMP and SAS. You can submit some code to run something on a SAS server and bring the results back as a JMP table. Then you can do lots of things with the JMP table to analyze the data returned. This workshop shows you how to access data via SAS servers, run SAS code and bring data back to JMP, and use JMP to do many things very quickly and easily. Explore the synergies between these tools; having both is a powerful combination that far outstrips just having one, or not using them together.

INTRODUCTION

This paper relates to a workshop that happened at SAS Global Forum 2017. Therefore, it is much more practical in its nature than most other papers. The ideal way to use this paper is to sit down with JMP installed on your PC or Mac, which are on the same network as your SAS server. This will mean you can go through the paper and try things out and see how JMP works, and the extra power it can add to a SAS installation. It's fortunate that JMP is freely available to download on a 30 day free trial, so anyone can try it. I am aiming at people who use SAS and understand SAS, but haven't used JMP before.

This paper will follow the structure of the workshop where we focused on a few areas during our 45 minutes. These were:

1. The JMP Table - in which we introduce you to the JMP table and some of the basics of how to use it. In SAS terms this is a bit like a SAS table, but with more metdata and other stuff crammed into it.
2. The Platform - in which we look at JMP Platforms, which are different kinds of analysis that you can open up that work against a JMP Table. They come in their own window with a specific interface for each one. In SAS terms, they are a bit like a SAS Procedure.
3. Using SAS from JMP - in which we start to look at how we can connect to SAS, and share data between SAS and JMP. Also how SAS ODS output can come to SAS.
4. More about using SAS from JMP - we look at how we can write SAS code in JMP and run it in SAS, bringing back results and tables produced. Also how we can use SAS Stored Processes from JMP.
5. Exploring JMP samples - we take a look at the wonderful resources available in JMP, such as the JMP samples and how we can learn a lot from them.

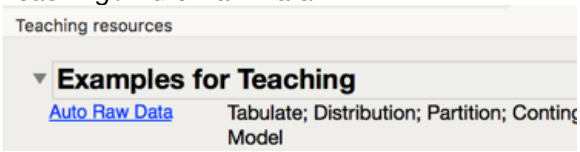
I hope you find this useful to read through and become convinced that every SAS user would become twice as effective by simply installing JMP on their machine.

THE JMP TABLE

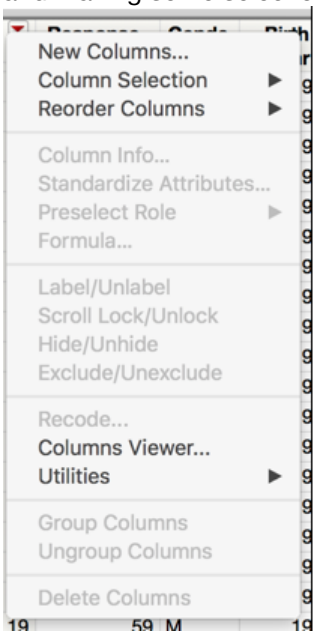
JMP tables are quite similar to SAS tables, having rows and columns of data, however there is much more to them. You can potentially have lots of metadata attached to your rows and columns. A column can be character, numeric, row state or an expression. You specify a modelling type for a column too such as continuous, ordinal, nominal, etc. There are lots of other properties you can define for your column covering many things from a color gradient to display based on the values, notes attached to that column, time frequency, range checking, value labels (which are a bit like a SAS format), etc. etc.

To begin we will open a JMP table and make sure that we understand the different parts of the table window. So follow these steps for a guided tour of sorts

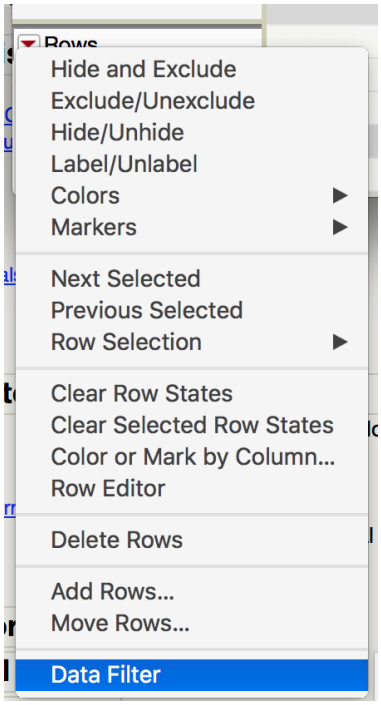
1) Start JMP version 13 from your Mac or Windows machine. You need to use this version since some things will be different in older versions.
2) Examine various windows opened automatically, then close them.
3) Open a table using Help / Sample Data / Teaching Resources / Examples for Teaching / Auto Raw Data.



4) Examine the interface
   a) Table in rows, columns
   b) List of saved scripts (top left). You can click on the green play button to run these. Right click on them for other options.
   c) Column list (mid left)
   d) Rows (bottom left)
5) Red triangles can be clicked on to give extra functionality, so try clicking on these and making some selections.



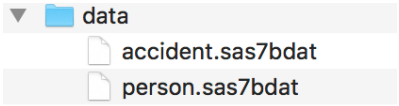
   a) Some red triangles will give you different options depending on what selections you have made in the table.
      i) Try clicking on a column name in the centre left list of columns, then click on red arrow there.
   b) Click on the red arrow next to Rows, and choose Data Filter



      and now make a Data Filter to see what that does. Choose a variable, or hold down control to select multiple variables, and click Add.
6) Click on the gray triangles, which open and close panels. These are handy if you want to hide part of the display so you can see other parts more fully.
7) Right click almost anywhere for specific functionality to where you click.
   a) Try right clicks on
      i) Column headers, both on the name of a column and in blank column.
      ii) Row headers, both on row number and blank row at end of table.
      iii) Cells.
      iv) Items in
         (1) top left box
         (2) middle left box
         (3) bottom left box
8) Load some SAS datasets
   a) File/Open
   b) Navigate to a location where you have some SAS datasets located. You can download them from many places online or access them over your

network.

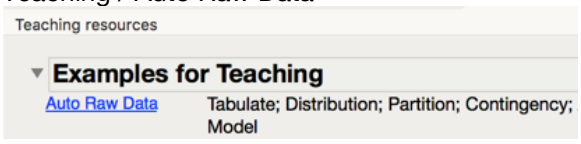
c) In the workshop we had some Car Safety datasets that were downloaded from the FARS web site. Open the tables and have a look how JMP can handle SAS data.



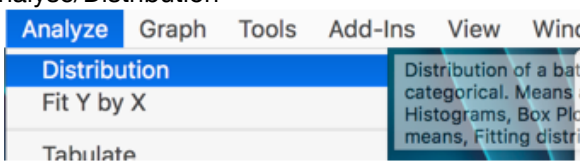
THE PLATFORM

A platform is what we use to do some analysis against a table in JMP. We can launch a Platform, and will get a dialog to specify some information about the analysis that we want to do. Then generally another window will open showing the results of the analysis that was done.

1) Start JMP 13.
2) Examine various windows opened automatically. These give you lots of ways to get started
3) Open a table using Help / Sample Data / Teaching Resources / Examples for Teaching / Auto Raw Data



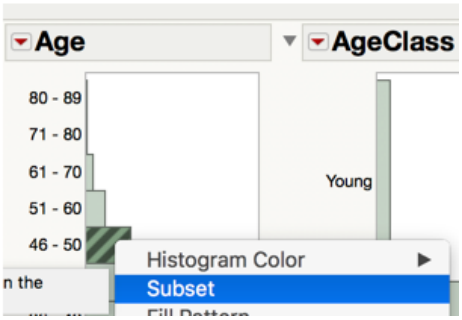
4) Analyse/Distribution



5) Select all columns (control A) or you can drag columns to the “Y, Columns” area.

6) Click on 

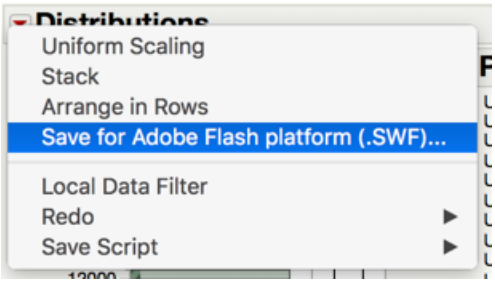
   a) OK
   b) Examine outputs
7) Click on a bar in a histogram and you will see all that data in other histograms highlighted
   i) Click on bar, then right click and choose subset



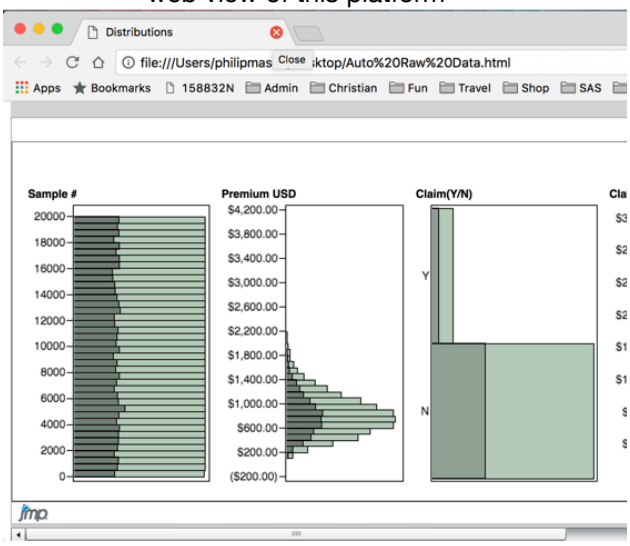
   ii) This makes a table with just those rows in it
8) Columns put into the new table are those which are marked with a label icon in the table 

9) Go back to table and look at what is marked with labels by using 

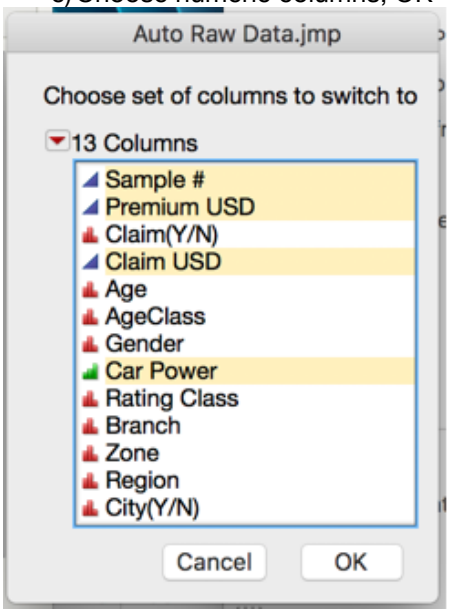
10) You can mark more columns as labels, and these can then be subsetted - try that.
11) Click on some red triangles to explore options available
   i) Click on red triangle next to distributions at top left, choose to save to a Flash file



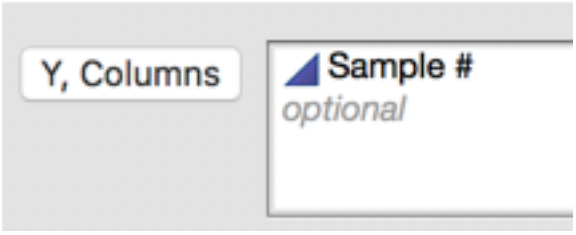
ii) Web page opens with an interactive web view of this platform



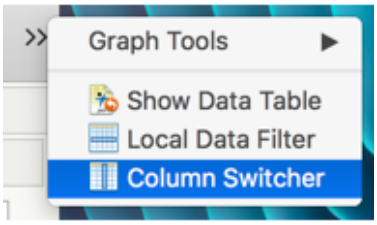
c) Choose numeric columns, OK



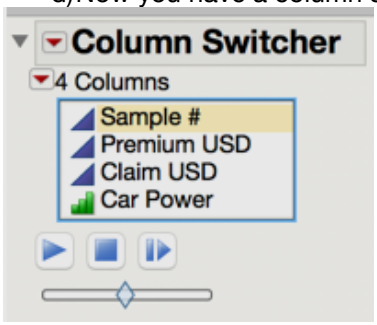
12) Add a local data filter using
13) Select Age and press Add
14) Select different ages to see distributions change
15) Open another distribution using Analyze/Distribution
    a) Just choose one Y, Column - then OK



b) Choose the Column Switcher tool



d) Now you have a column switcher



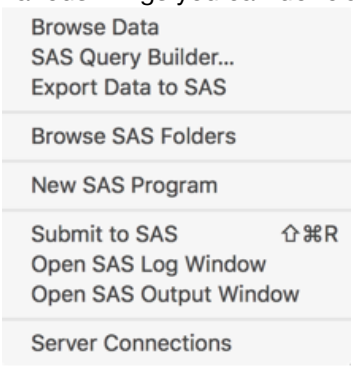
16) Select different values to see effect
    a) Click on play to see what happens

USING SAS FROM JMP

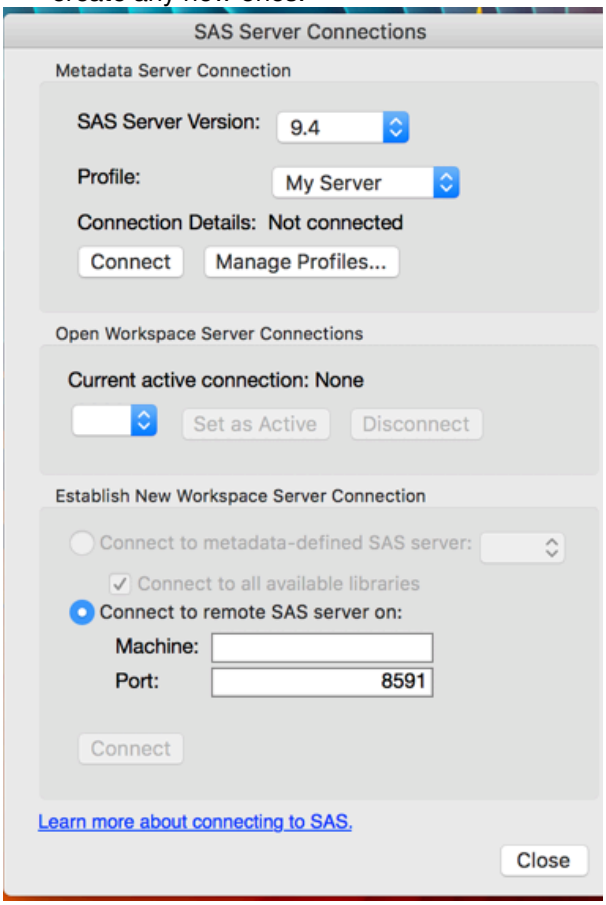
JMP can integrate with SAS quite easily, allowing:

- Connecting to SAS, which will start a Workspace Server session linked to your JMP program. This will then allow you to do all kinds of things in SAS from JMP.
- Defining how the connection behaves in various ways
- Moving data to between JMP and SAS

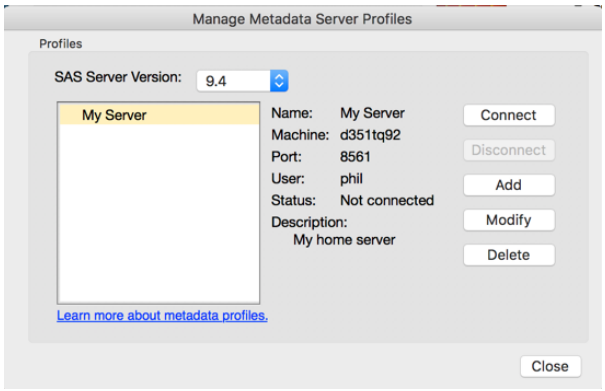
1. File - SAS, which will show you the various things you can do related to SAS.



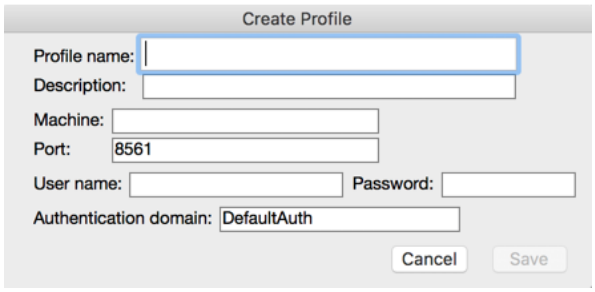
2. Server Connections. Lets you manage the connections you have open to SAS and create any new ones.



3. Click on Manage Profiles, which will let you work with a profile that lets you connect to SAS.

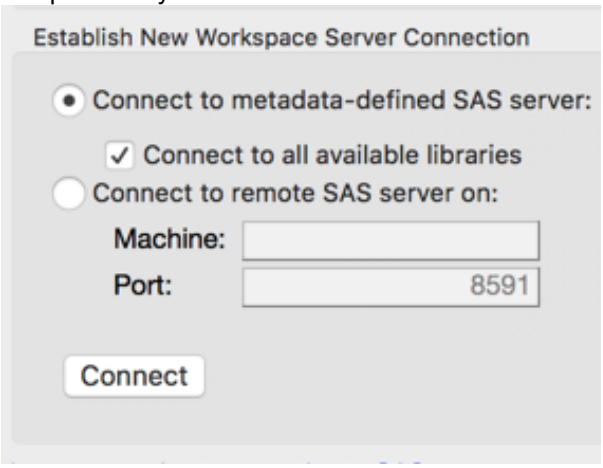


4. Click on Add to add a new profile which lets you define how to connect to a SAS server.

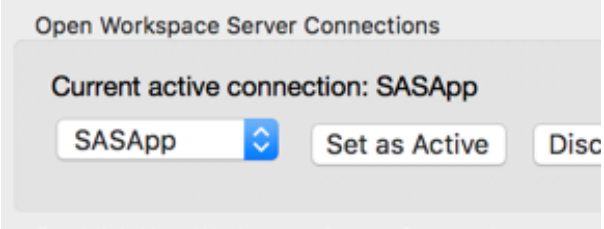


5. Enter the following details:
   a. Profile name: can be anything you like
   b. Description: not required, but you might as well make one.
   c. Machine: Get this from your SAS Administrator
   d. Port: Usually 8561, but you can get it from your SAS Admin.
   e. User name: The one you use to connect to SAS
   f. Password: For connecting to SAS.
   g. Authentication domain: DefaultAuth
   h. Finally, click on Save
   i. Select your profile and press Connect button
   j. when connected, press Close button
6. Connect to a new workspace server connection, since you have to actually connect using a Profile that you have

previously created.

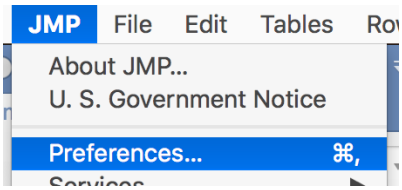


7. You should now see you are connected.

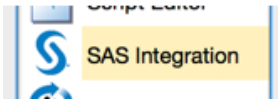


   a. press Close button

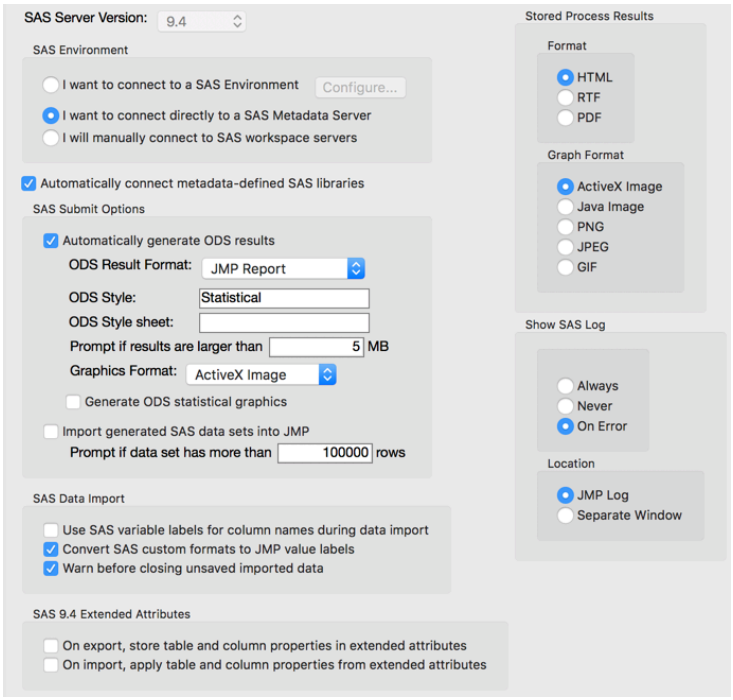
8. Choose JMP/Preferences from the menu.



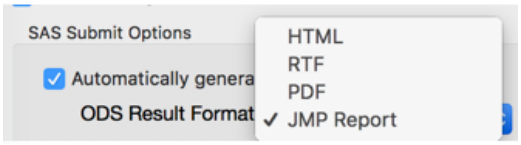
Now you will see a window with lots of preferences displayed, so select SAS Integration.



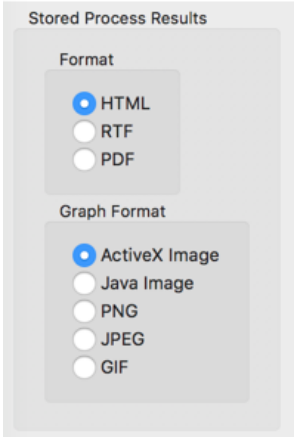
This displays all the preferences related to SAS Integration.



You can choose the ODS Result format that you want your SAS programs to create. If you choose JMP Report then any ODS output from SAS will be brought down to JMP in a compatible format which lets you use some of the JMP functionality with it.

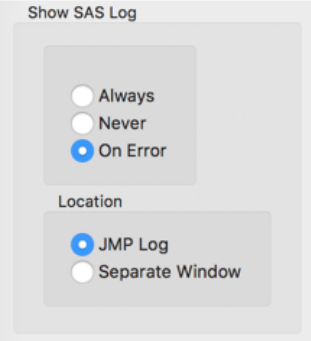


You can choose the format of Stored Process results, which unfortunately cant be in JMP Report form, but can be HTML, RTF or PDF.

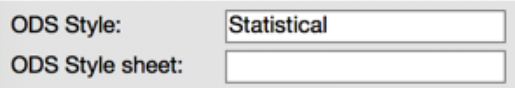


You can choose when you want to see the SAS log, and whether it is just loaded into the JMP log, or if you want it separated out into another

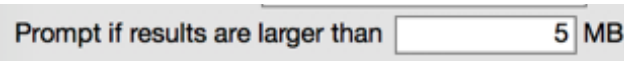
window.



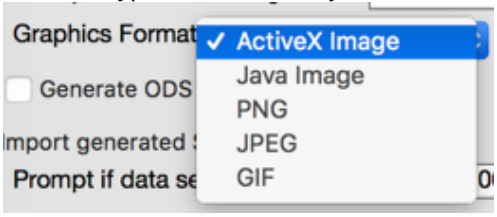
You can enter an ODS style or Stylesheet to use, although you don't get a list to select from so you need to know what styles are available in SAS.



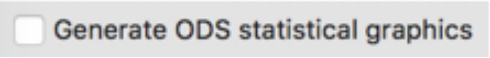
The next part will allow you to set a limit at which you will be prompted to bring down large results. If you are on a slower network you might want a lower figure, or raise it if things are fast.



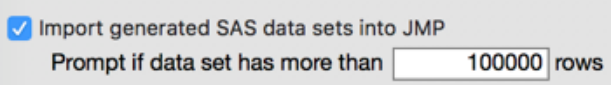
You can choose the graphics format, and potentially pick one of the interactive types or a different type if that's what you need.



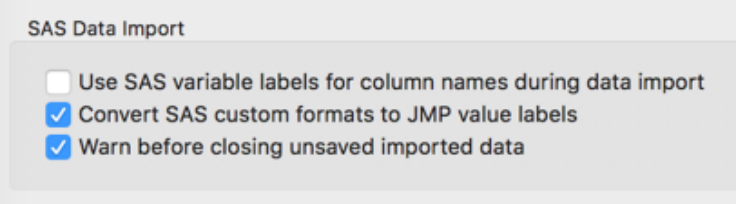
There are various optional statistical graphics that can be generated in SAS, and here you can choose whether to generate them by default.



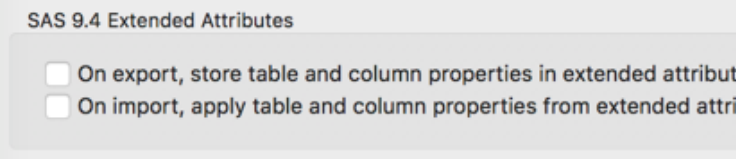
This is one of the most important preferences. This will let you load and SAS data sets generated by SAS code you send to the server to be automatically downloaded to JMP as a JMP table. This will then let you do lots of things using that table.



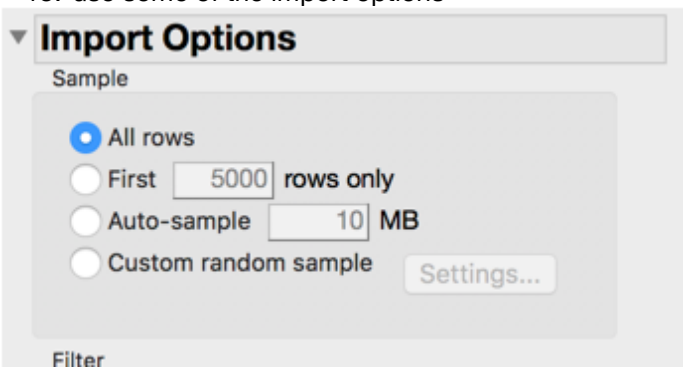
As the tables generated in SAS are downloaded to JMP you have some additional choices on what to do.



These next options allow you to use Extended Attributes of SAS tables (available in SAS 9.4) to store extra metadata from JMP. That means that if you upload a JMP table to SAS, those extended attributes will hold the metadata allowing them to be downloaded from the SAS server to another JMP user with all the metadata intact. Very useful if you are moving data to and from SAS, or want to share things between JMP and SAS users.



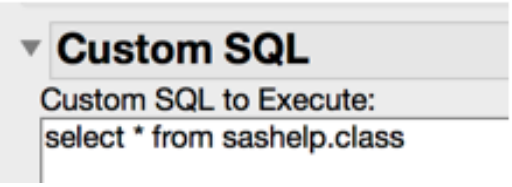
9. File/SAS/Browse Data
10. Explore the data available
    a. clicking on Libraries to see tables in a library
    b. click on a table to see columns in that table, and a data Preview at the bottom
    c. click on a column to see its attributes
    d. select sashelp.classfit
    e. click on import button
11. you now have a SAS table in JMP
    a. Top left shows the SQL used to import your table
12. Go back to Browse SAS data and try importing some other tables
13. use some of the import options



    a. Try using the filter, to enter a

where clause

14. try entering some Custom SQL



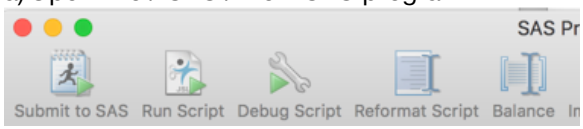
    a. Remember to use the grey arrows  to fold away panels of info

15. Export data to SAS
    a. open some data using Help/Sample Data, then finding a table
16. File/Export
    a. Text, will let you save a CSV file or other
    b. JSON, used in many Internet technologies
    c. EXCEL
    d. SAS, makes into a sas7bdat file
    e. SAS Transport
17. File/SAS/Export data to SAS
    a. select data to export - pick the open table to export
    b. select destination Server and Library
18. Export options
    a. save JMP metadata, means we can load it back to JMP and restore metadata

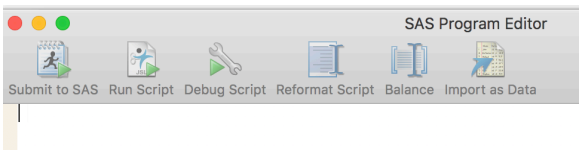
MORE ABOUT USING SAS FROM JMP

JMP can integrate with SAS quite easily, allowing SAS code to be run, with results returned to JMP. And it can also allow Stored Processes to be run. This section will walk through doing some of that to show how its done.

1) SAS programming can be done from JMP as follows.
   a) Open File / SAS / New SAS program

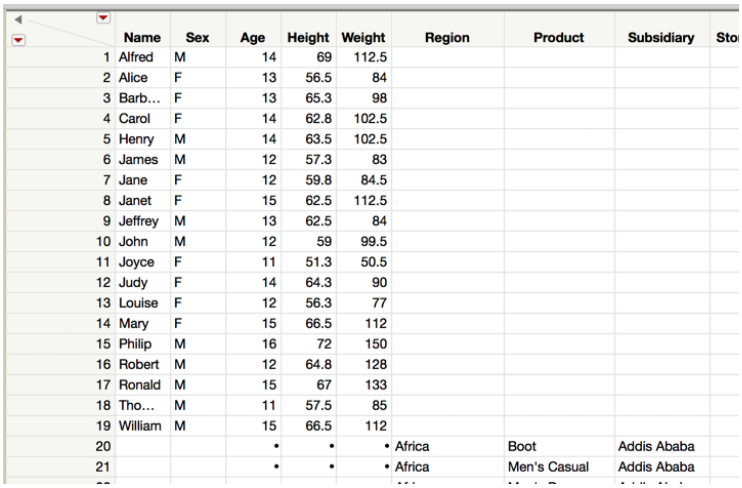


   i) We can write programs that produce data. You just enter your program in the SAS Program Editor, and then click on the Submit to SAS tool to send it up to the SAS workspace server you are connected to in order to run it.



Here is a simple data step to produce some data.

```
data silly ;
  set sashelp.class sashelp.shoes ;
run ;
```



	Name	Sex	Age	Height	Weight	Region	Product	Subsidiary	Sto
1	Alfred	M	14	69	112.5				
2	Alice	F	13	56.5	84				
3	Barb…	F	13	65.3	98				
4	Carol	F	14	62.8	102.5				
5	Henry	M	14	63.5	102.5				
6	James	M	12	57.3	83				
7	Jane	F	12	59.8	84.5				
8	Janet	F	15	62.5	112.5				
9	Jeffrey	M	13	62.5	84				
10	John	M	12	59	99.5				
11	Joyce	F	11	51.3	50.5				
12	Judy	F	14	64.3	90				
13	Louise	F	12	56.3	77				
14	Mary	F	15	66.5	112				
15	Philip	M	16	72	150				
16	Robert	M	12	64.8	128				
17	Ronald	M	15	67	133				
18	Tho…	M	11	57.5	85				
19	William	M	15	66.5	112				
20			•	•	•	Africa	Boot	Addis Ababa	
21			•	•	•	Africa	Men's Casual	Addis Ababa	

Here is a simple SAS procedure to produce some data.

```
proc summary data=sashelp.class ;
  class sex ;
  var age ;
  output out=class_summary mean= ;
run ;
```

Here is the top left area of the table downloaded, which shows some info about it.

CLASS_SUMMARY

SAS Server SASApp
Data set WORK.CLASS_SUMMARY
SQL SELECT * FROM Work.CLASS_SUMMARY
Source

Here's the table data that was downloaded.

	Sex	_TYPE_	_FREQ_	Age
1		0	19	13.3157894
2	F	1	9	13.2222222
3	M	1	10	1

ii) We can also write SAS programs that produce ODS output

Here is a simple SAS program to produce some ODS output.

```
proc freq data=sashelp.shoes ;
run ;
```

The SAS System
The FREQ Procedure

The Freq Procedure

Table Region

One-Way Frequencies

Region	Frequency	Percent	Cumulative Frequency	Cu
Africa	56	14.1772	56	
Asia	14	3.5443	70	
Canada	37	9.36709	107	
Central America/Caribbean	32	8.10127	139	
Eastern Europe	31	7.8481	170	
Middle East	24	6.07595	194	
Pacific	45	11.3924	239	
South America	54	13.6709	293	
United States	40	10.1266	333	
Western Europe	62	15.6962	395	

Table Product

One-Way Frequencies

Product	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Boot	52	13.1646	52	13.1646
Men's Casual	45	11.3924	97	24.557
Men's Dress	50	12.6582	147	37.2152
Sandal	49	12.4051	196	49.6203
Slipper	52	13.1646	248	62.7848
Sport Shoe	51	12.9114	299	75.6962
Women's Casual	45	11.3924	344	87.0886
Women's Dress	51	12.9114	395	100

Table Subsidiary

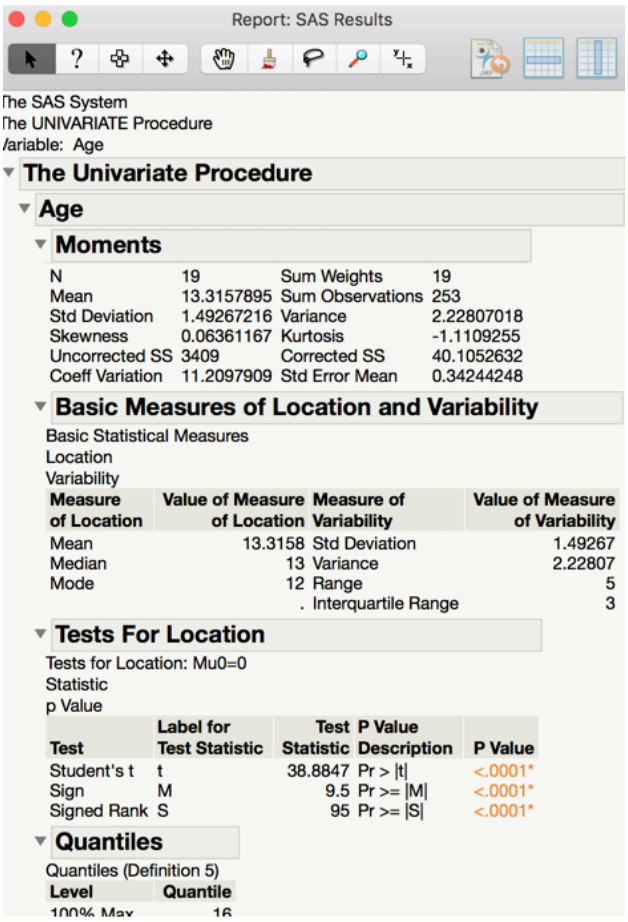
One-Way Frequencies

Subsidiary	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Addis Ababa	8	2.02532	8	2.02532
Al-Khobar	8	2.02532	16	4.05063
Algiers	7	1.77215	23	5.82278

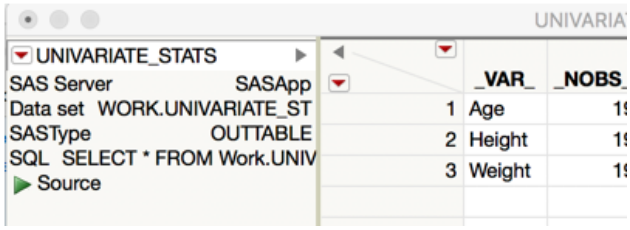
iii)We can also write programs producing tables and ODS output at the same time.

```
proc univariate data=sashelp.class
        outtable=univariate_stats ;
run ;
```

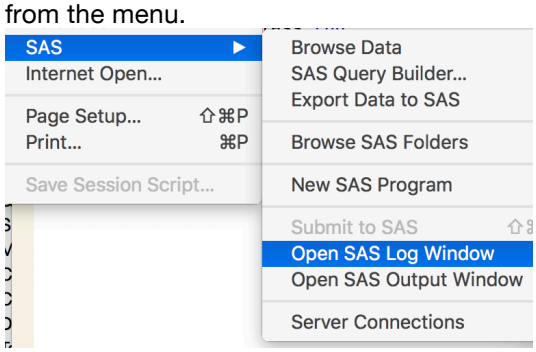
Here's the ODS output.



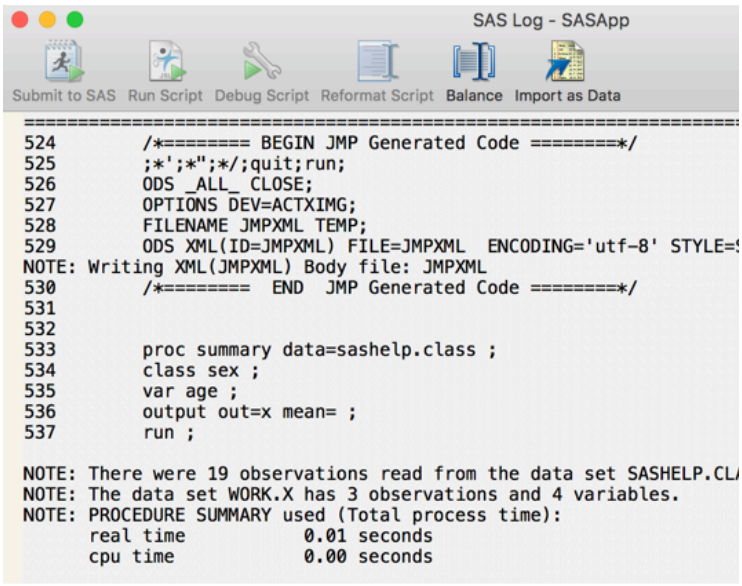
Here's the table that was downloaded.



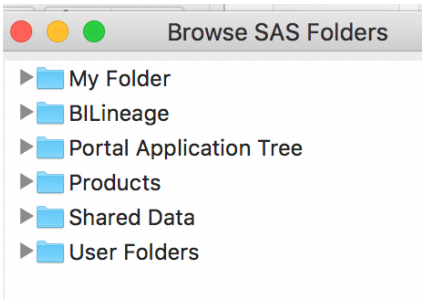
b) Open SAS LOG by choosing that option from the menu.



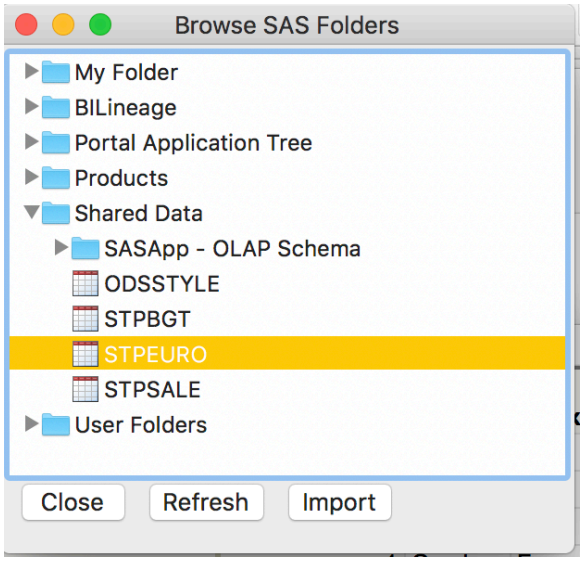
And here is the SAS log.



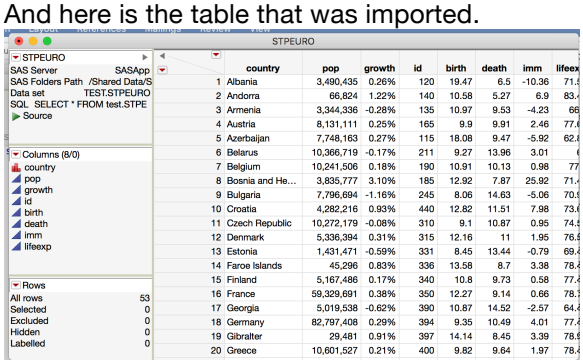
2) Choose the menu items File / SAS / Browse SAS folders
This will give you a list of SAS folders in the metadata.



a) Import a table defined by navigating to a table metadata definition and importing it into JMP.

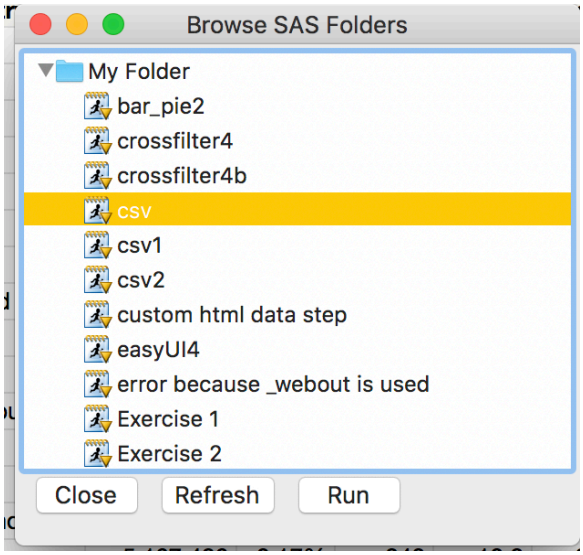


And here is the table that was imported.

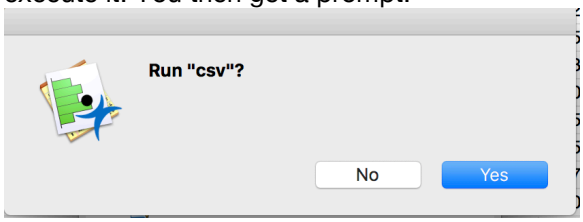


	country	pop	growth	id	birth	death	imm	lifeex
1	Albania	3,490,435	0.26%	120	19.47	6.5	-10.36	71.5
2	Andorra	66,824	1.22%	140	10.58	5.27	6.9	83.4
3	Armenia	3,344,336	-0.28%	135	10.97	9.53	-4.23	66
4	Austria	8,131,111	0.25%	165	9.9	9.91	2.46	77.6
5	Azerbaijan	7,748,163	0.27%	115	18.08	9.47	-5.92	62.8
6	Belarus	10,366,719	-0.17%	211	9.27	13.96	3.01	
7	Belgium	10,241,506	0.18%	190	10.91	10.13	0.98	77
8	Bosnia and He...	3,835,777	3.10%	185	12.92	7.87	25.92	71.4
9	Bulgaria	7,796,694	-1.16%	245	8.06	14.63	-5.06	70.9
10	Croatia	4,282,216	0.93%	440	12.82	11.51	7.98	73.6
11	Czech Republic	10,272,179	-0.08%	310	9.1	10.87	0.95	74.5
12	Denmark	5,336,394	0.31%	315	12.16	11	1.95	76.9
13	Estonia	1,431,471	-0.59%	331	8.45	13.44	-0.79	69.4
14	Faroe Islands	45,296	0.83%	336	13.58	8.7	3.38	78.4
15	Finland	5,167,486	0.17%	340	10.8	9.73	0.58	77.4
16	France	59,329,691	0.38%	350	12.27	9.14	0.66	78.1
17	Georgia	5,019,538	-0.62%	390	10.87	14.52	-2.57	64.4
18	Germany	82,797,408	0.29%	394	9.35	10.49	4.01	77.4
19	Gibraltar	29,481	0.91%	397	14.14	8.45	3.39	78.9
20	Greece	10,601,527	0.21%	400	9.82	9.64	1.97	78.4

b) Run a stored process or stored process report. You just need to navigate through the metadata to a Stored Process and select it.



Then just click on the Run button to execute it. You then get a prompt.

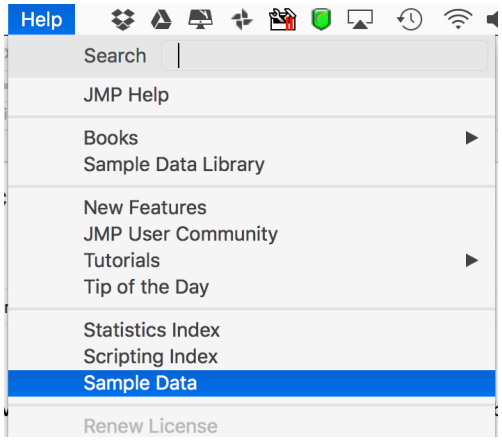


The Stored Process will run and the results open in the web browser.

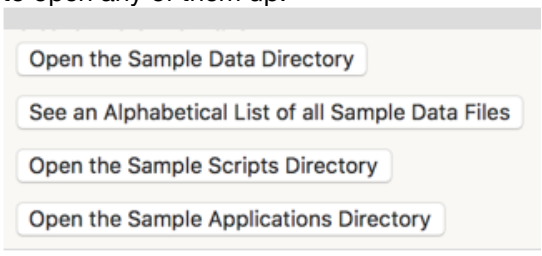
EXPLORING JMP SAMPLES

A great way to learn about JMP is to look at the samples. You can click on one of the 4 buttons to access the Sample data in different ways, look at the data categorized by type of analysis or type of data, and more. You can even link to JMP add-ins on the web which can be downloaded and integrated into JMP to add more functionality.

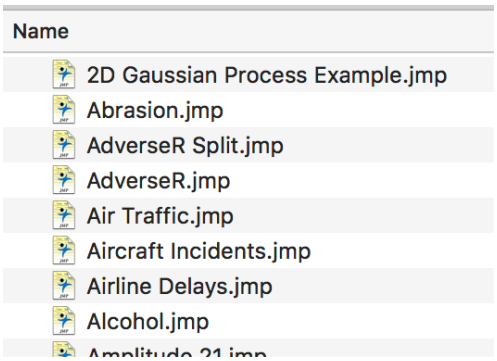
1) Open Sample Data Index using Help/Sample Data



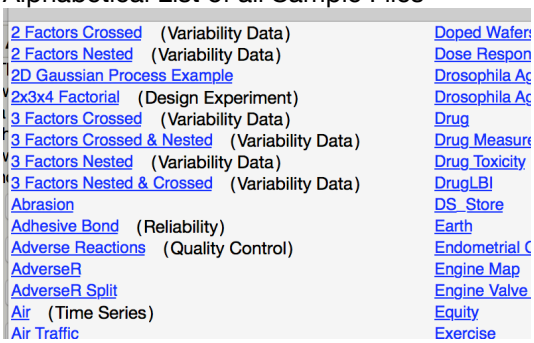
2) Click on the top 4 buttons and try some of the content by clicking on it. Then double click to open any of them up.



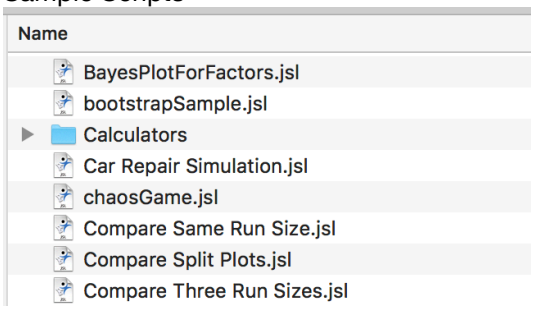
a) Sample Data Directory



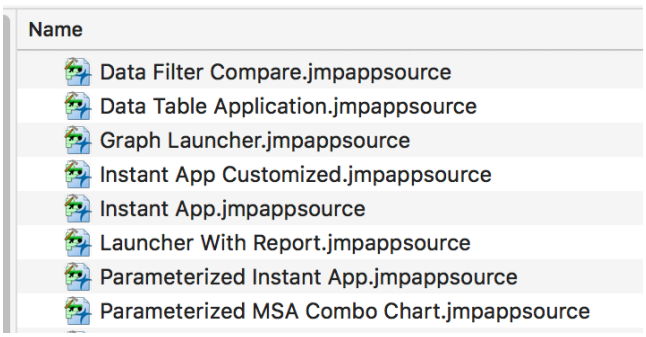
b) Alphabetical List of all Sample Files



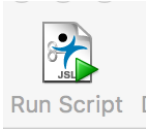
c) Sample Scripts



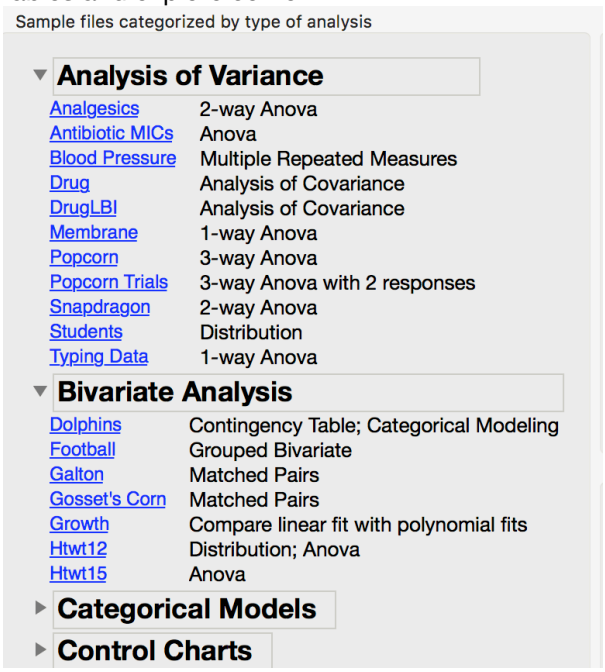
d) Sample Applications



Once you double click and open one up, you need to click on the Run Script button to run it.

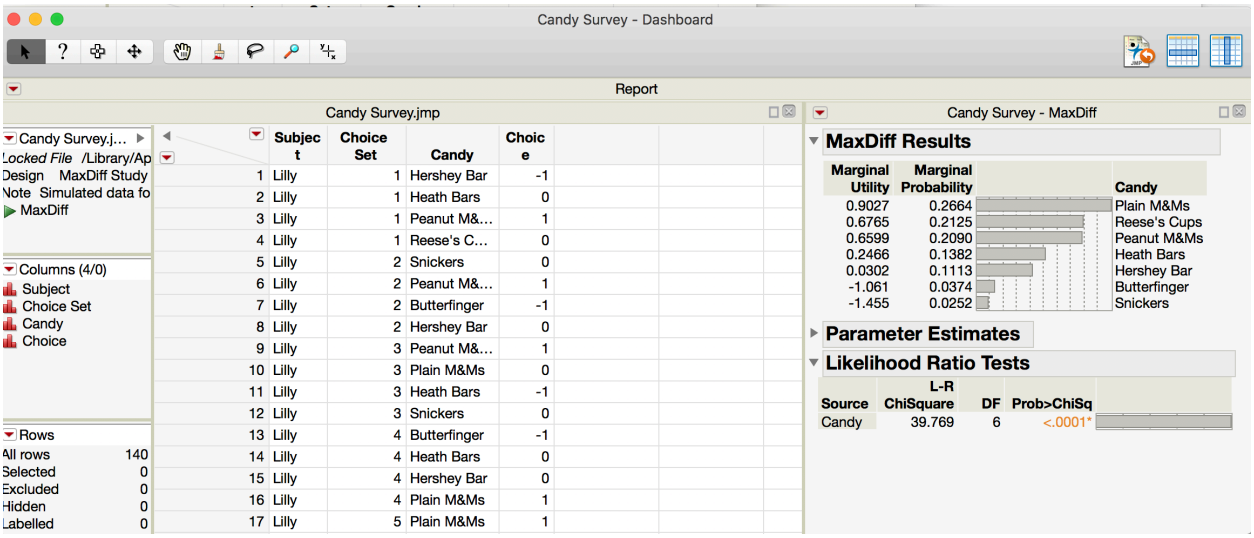


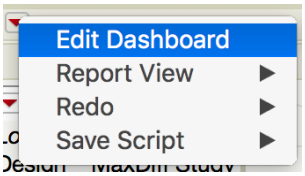
3) Expand the sample files in other areas
   a) Click on some of those links to open tables and explore content



MAKING APPLICATIONS

Very briefly I thought I would mention how you can easily build an application in JMP. Just open a table up, then open a platform or two. So now you have a table and some related windows open. So go to the Window menu and choose Combine Windows. You can now choose windows which are open to be combined into an application. Once you do this and press OK then the application is opened.





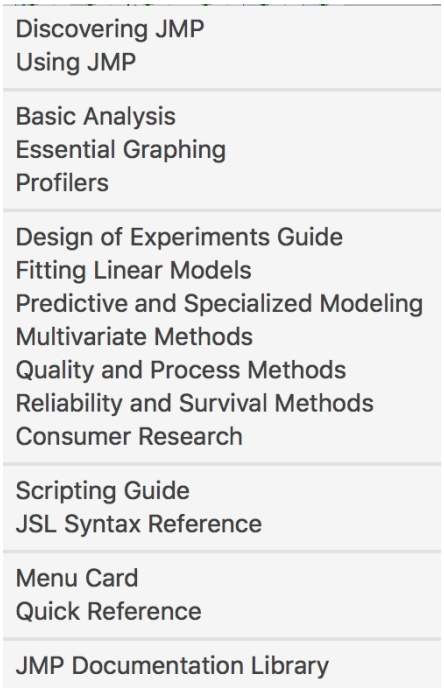
Clicking on the red arrow in the top left will give you some options. One of these options will let you Edit the Dashboard

CONCLUSION

SAS is a great tool and JMP is too. Adding JMP to a SAS installation will let you combine these two tools in a great way. For me one of the main advantages is speed, since all of JMPs data is kept in memory I find everything works extremely fast, whereas my SAS server isn't so quick. Because of the speed I can get a lot done interactively which lets me explore and understand my data without writing any code, but everything I do is repeatable through the JSL code that is always generated as I do things.

In my last consulting project we did a lot of data mapping, profiling and cleaning. For just that one project if we had JMP we could have saved at least 1 full time resource over the 2 year project which would have paid for JMP about 200 times over.

RECOMMENDED READING



In JMP just open up the Help Menu and choose books. This will show you a list of JMP books covering everything you could ever want to know.

CONTACT INFORMATION

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

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