



Essentials of the SAS[®] Output Delivery System (ODS)

DCSUG Special Evening Meeting

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Essentials of the SAS Output Delivery System

- Beginning Tutorial
- Introduce Key Concepts and Capabilities of the SAS Output Delivery System
- Show Ways to Get Things Done
 - Faster
 - Quicker
 - Easier
 - Better
 - With ODS

Create Data Set

> Generate a Permanent SAS Data Set

```
2 * assign library reference and make permanent SAS data set;
3 libname dnsc276 'C:\Documents and Settings\Andrew Karp\Desktop\DNSC276';
4
5 * create data set, assign variable labels;
6 data dnsc276.rcmp;
7 input DETACHMENT SATF1 SATF2 SATF3 SATF4;
8 label DETACHMENT = 'RCMP Detachment'
9       SATF1 = 'Satisfaction With Job Characteristics'
10      SATF2 = 'Satisfaction With Salary and Benefits'
11      SATF3 = 'Satisfaction With Commanding Officer'
12      SATF4 = 'Satisfaction with Co-Workers';
13 datalines;
14 1 3.8 4.0 4.0 4.0
15 1 3.0 3.5 5.0 4.0
16 1 3.6 4.5 3.0 3.0
17 1 3.2 2.5 4.0 5.0
18 1 3.8 3.0 5.0 3.0
19 1 4.4 4.5 5.0 5.0
20 2 3.8 4.5 5.0 4.0
```

Approach

> Run separate linear models (ANOVAs) on each of the four measures.

```
143 * run four separate one-day anovas;
144 proc glm data=dnsc276.rcmp;
145 class detachment;
146 * note list-addressing of variables w/common prefix;
147 model satf1 - satf4 = detachment;
148 title5 'One Way Anovas for Each Job Satisfaction Measure';
149 quit;
```



Four One-Way ANOVAs: I

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Decision Science 276: Exploratory and Multivariate Data Analysis
Lecture 4: Fall 2007 Semester
Introduction to Multivariate Analysis
One Way Anovas for Each Job Satisfaction Measure

The GLM Procedure

Dependent Variable: SATF1 Satisfaction With Job Characteristics

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	9	6.33919973	0.70435553	2.05	0.0428
Error	86	29.50080027	0.34303256		
Corrected Total	95	35.84000000			

R-Square	Coeff Var	Root MSE	SATF1 Mean
0.176875	16.04630	0.585690	3.650000

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DETACHMENT	9	6.33919973	0.70435553	2.05	0.0428

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DETACHMENT	9	6.33919973	0.70435553	2.05	0.0428



Four One-Way ANOVAs: II

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One Way Anovas for Each Job Satisfaction Measure

The GLM Procedure

Dependent Variable: SATF2 Satisfaction With Salary and Benefits

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	9	4.35528003	0.48392000	0.92	0.5131
Error	86	45.30096997	0.52675546		
Corrected Total	95	49.65625000			

R-Square	Coeff Var	Root MSE	SATF2 Mean
0.087709	19.85037	0.725779	3.656250

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DETACHMENT	9	4.35528003	0.48392000	0.92	0.5131

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DETACHMENT	9	4.35528003	0.48392000	0.92	0.5131



Four One-Way ANOVAs: III

```
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One Way Anovas for Each Job Satisfaction Measure

The GLM Procedure

Dependent Variable: SATF3 Satisfaction With Commanding Officer

Source              DF              Sum of
Squares              Mean Square      F Value      Pr > F
Model                9              54.1874044      6.0208227      7.42      <.0001
Error                86              69.7709289      0.8112899
Corrected Total      95              123.9583333

R-Square      Coeff Var      Root MSE      SATF3 Mean
0.437142      22.63580      0.900716      3.979167

Source              DF              Type I SS      Mean Square      F Value      Pr > F
DETAACHMENT        9              54.18740441      6.0208271      7.42      <.0001

Source              DF              Type III SS      Mean Square      F Value      Pr > F
DETAACHMENT        9              54.18740441      6.0208271      7.42      <.0001
```

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Four One-Way ANOVAs: IV

```
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One Way Anovas for Each Job Satisfaction Measure

The GLM Procedure

Dependent Variable: SATF4 Satisfaction with Co-Workers

Source              DF              Sum of
Squares              Mean Square      F Value      Pr > F
Model                9              4.43600709      0.49288968      0.99      0.4541
Error                86              42.80357625      0.49771600
Corrected Total      95              47.23958333

R-Square      Coeff Var      Root MSE      SATF4 Mean
0.093904      16.80571      0.705490      4.197917

Source              DF              Type I SS      Mean Square      F Value      Pr > F
DETAACHMENT        9              4.43600709      0.49288968      0.99      0.4541

Source              DF              Type III SS      Mean Square      F Value      Pr > F
DETAACHMENT        9              4.43600709      0.49288968      0.99      0.4541
```

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● ● ● | Some Problems

- **Technical/Reporting of Results:**
- **How can we.....**
 - “Easily” combine the ‘important’ parts of the results from our four one-way ANOVAs in to a single table that summarizes our findings and which we can easily display in a report or paper?
 - “Easily” control the appearance of our report based on the values of data IN the report?
 - Share our results with others?
 - Solution: ODS

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● ● ● | Technical/Reporting of Results

- **Many “runs” of analytic procedures required to carry out a single “project” or “analysis”**
 - Procedure output often needs to be re-arranged/combined in to a “final” report
 - Report needs to be “submitted” or “delivered” in some other format than the SAS Output Window
 - Examples: PDF, RTF (for inclusion in a Word Document or Powerpoint Presentation), HTML
 - Researcher/Analyst wants to control appearance of output
 - Assign colors to some values, add graphics, etc.
 - Display output in accordance with professional journal style requirements or in compliance with a “corporate identify standard”

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SAS Output Delivery System (ODS)

- Added to BASE SAS Software in Version 8
- Process by which the SAS System “delivers” output to “destinations”
- Completely revolutionized way that SAS users work with Procedure-generated output
- Provides complete control over what is being generated, where it is “delivered” and what it looks like.

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SAS Output Delivery System (ODS)

- **Why You Should Learn About ODS:**
 - Create SAS-generated output as PDF, RTF, HTML, CSV or other files, including SAS data sets
 - Control the appearance of output using Style Templates
 - Combine output from multiple “PROC steps” in to one customized report
 - Facilitate generation of “final report” without tedious re-typing, cutting and pasting, or use of “PROC HIGHLIGHTER” or “PROC CUT and PASTE”
 - Share SAS Output with Others

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SAS Output Delivery System (ODS)

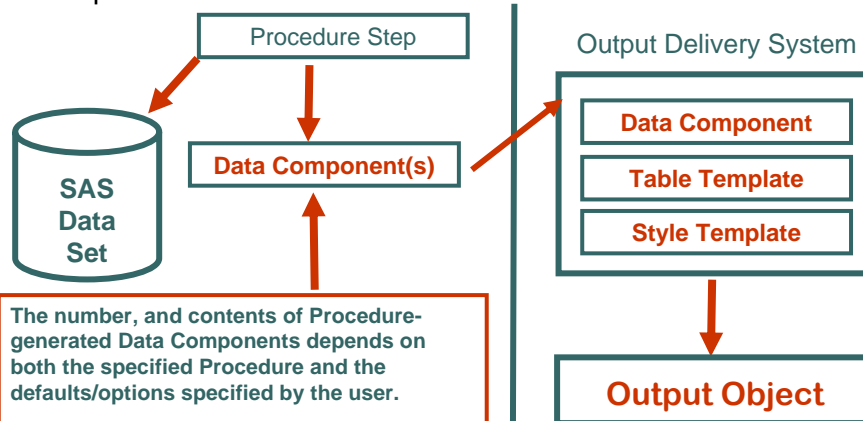
> How it works:

- Procedure carries out the work/tasks specified in the PROC “step” or those which it carries out by default.
- Procedure generates one or more “**data components**” and “passes” them to the ODS.
- ODS binds the each data component to a **table component**, consisting of a **style template** and a **table template**, resulting in an **output object**.
- **Object** is then “**delivered**” to all currently **open “destinations”**

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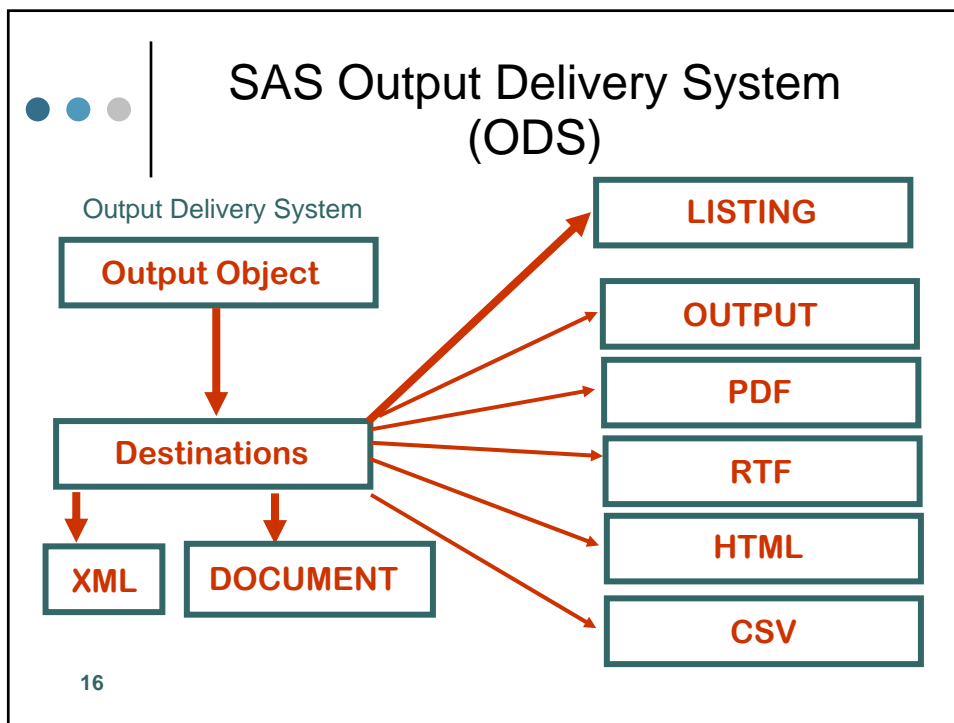
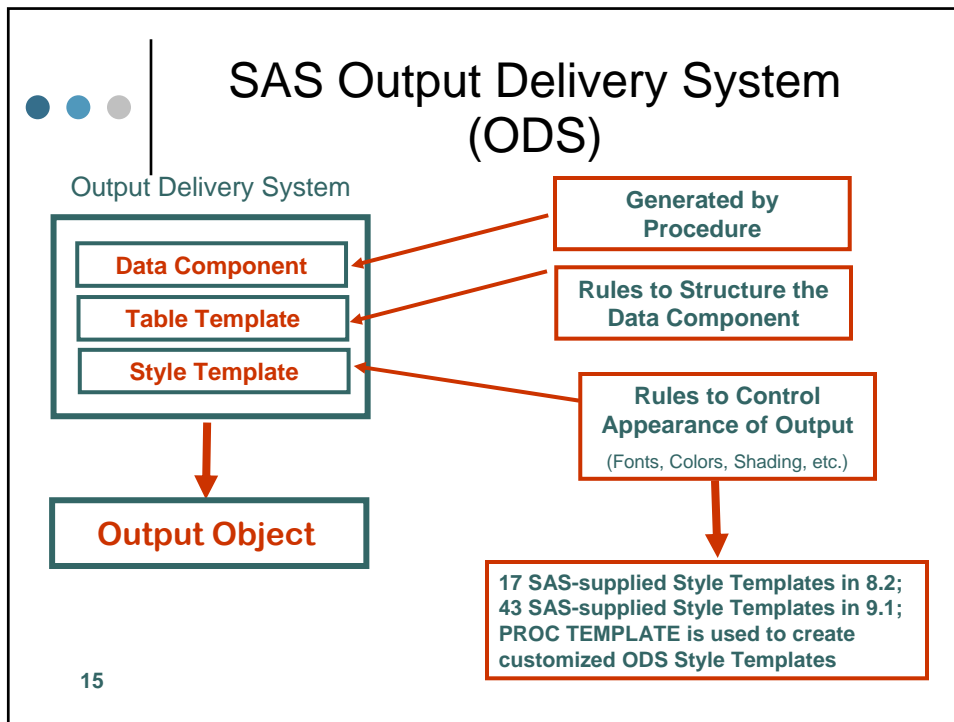


SAS Output Delivery System (ODS)



The number, and contents of Procedure-generated Data Components depends on both the specified Procedure and the defaults/options specified by the user.
A Data Component contains the “work” carried out by the PROC on the data stored in the SAS data set.

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ODS “Destinations”

- **Default Destination is LISTING**
 - Output Window
- **Other Destinations Can Be Opened and Closed as Needed During Program Execution**
- **By Default, Output Objects are Not Saved after “Delivery” to the “Destinations”**
 - SAS 9: DOCUMENT Destination
 - See my paper “A Peek at PROC DOCUMENT,” presented at the SAS Global Forum 2007 Conference
 - <http://www2.sas.com/proceedings/forum2007/224-2007.pdf>

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ODS DOCUMENT “Resources”

SAS Global Forum 2007 Tutorials

Paper 224-2007
A Peek at PROC DOCUMENT

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Abstract

A major enhancement to the SAS Output Delivery System (ODS) in SAS 9 Software is implementation of the DOCUMENT Destination, which allows SAS users to store ODS-generated objects in a re-useable file structure called a “document.” ODS DOCUMENTS can be accessed, re-played, and manipulated using the new DOCUMENT Window or PROC DOCUMENT, an interactive BASE SAS Procedure which is also new in SAS 9. Learning to use the DOCUMENT Destination, DOCUMENT Window and DOCUMENT Procedure will give you enhanced control and flexibility when using ODS to generate output from SAS Procedures.

Core Concepts: ODS Tables, Objects and Destinations

In order to understand the new DOCUMENT capabilities added in SAS 9, it is important to first understand how the Output Delivery System works within the overall framework of the SAS System’s creation of output by Procedures.

Prior to production implementation of Output Delivery System features in Version 8 of the SAS System, each PROC generated output and used a very limited control over the structure of the procedure-generated output.

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ODS Statistical Graphics

- Experimental in SAS 9.1, Production in 9.2
- Extends ODS capabilities to enable analytic PROCs to generate graphics
- More Information:
 - “An Introduction to ODS for Statistical Graphics in SAS 9.1”
 - <http://www2.sas.com/proceedings/sugi29/204-29.pdf>
 - “Statistical Graphics Using ODS-Experimental”
 - Chapter 14 of the SAS/STAT Documentation for SAS 9.1
 - <http://support.sas.com/onlinedoc/913/docMainpage.jsp>

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ODS Statistical Graphics

Overview

Graphics are indispensable for modern statistical analysis. They enrich the analysis by revealing patterns, identifying differences, and expressing uncertainty that would not be readily apparent in tabular output. Effective graphics also add visual clarity to an analytical presentation, and they provoke questions that would not otherwise be raised, stimulating deeper investigation.

In SAS 9.1, a number of SAS/STAT procedures have been modified to use an experimental extension to the Output Delivery System (ODS) that enables them to create statistical graphics as automatically as tables. This facility is referred to as *ODS Statistical Graphics* (or *ODS Graphics* for short), and it is invoked when you provide the experimental ODS GRAPHICS statement prior to your procedure statements. Any procedures that use ODS Graphics then create graphics, either by default or when you specify procedure options for requesting specific graphs.

With ODS Graphics, a procedure creates the graphs that are most commonly needed for a particular analysis. In many cases, graphs are automatically enhanced with useful statistical information or metadata, such as sample sizes and p-values, which is displayed in an inset box. Using ODS Graphics eliminates the need to save numerical results in an output data set, manipulate them with a DATA step program, and display them with a graphics procedure.

The SAS/STAT procedures that use ODS Graphics in SAS 9.1 are listed on [this page](#). The plots produced by each procedure and any corresponding options are described in the procedure chapter. See the “ODS Graphics” subsection in the “Details” section of each procedure chapter for additional information.

In many ways, creating graphics with ODS is analogous to creating tables with ODS. You use

- procedure options and defaults to determine which graphs are created.

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● ● ● | **Example: Combining Output from Multiple Procedure “Runs” Using ODS and the OUTPUT Destination**

- **Goal: Take the “important” pieces of the four one-way ANOVA output in the Output Window and combine them in to a single table that can be introduced in to a report.**
- **Solution: ODS Output Destination**
 - Saves Output Objects as Permanent or Temporary SAS Data Sets
 - Useful way to “capture” output from multiple analytic procedure “runs”

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● ● ● | **Learning ODS Table Names**

- **ODS Tables (or Objects) have names corresponding to the contents of the table**
- **Table names ARE NOT unique to a single Procedures**
 - Multiple procedures can generate a “Parameter Estimates” or “Fit Statistics” table, for example
 - Procedure Documentation
 - ODS TRACE ON/LISTING;
 - ODS TRACE OFF;

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Learning ODS Table Names

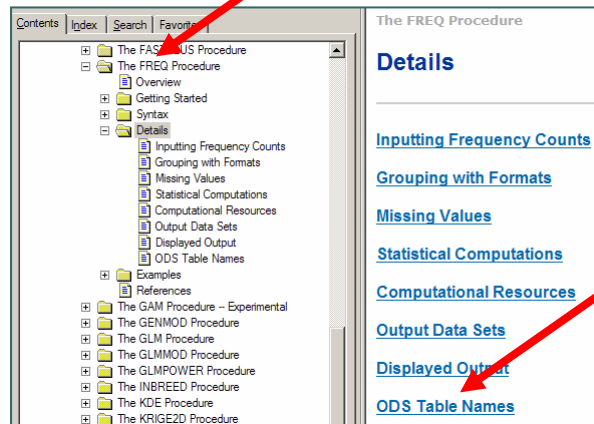
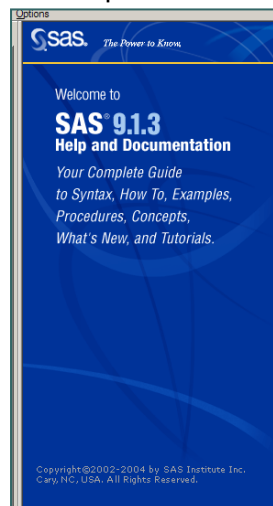
```
152 * find ODS table names;
153 ods trace on/listing;
154 proc glm data=dns276.rcmp;
155 class detachment;
156 model satf1 = detachment;
157 title 'Find ODS Table Names';
158 quit;
159 ods trace off;
```

ODS TRACE ON/LISTING statement directs SAS to write ODS table names in to the LISTING Destination (the Output Window) immediately before the table itself. Remains in effect until you submit ODS TRACE OFF

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Learning ODS Table Names





Learning ODS Table Names

The FREQ Procedure

ODS Table Names

PROC FREQ assigns a name to each table it creates. You can use these names to reference the table when using the Output Delivery System (ODS) to select tables and create output data sets. For more information on ODS, see Chapter 14, "Using the Output Delivery System."

Table 29.11 lists the ODS table names together with their descriptions and the options required to produce the tables. Note that the ALL option in the TABLES statement invokes the CHISQ, MEASURES, and CMH options.

Table 29.11: ODS Tables Produced in PROC FREQ

ODS Table Name	Description	Statement	Option
BinomialProp	Binomial proportion	TABLES	BINOMIAL (one-way tables)
BinomialPropTest	Binomial proportion test	TABLES	BINOMIAL (one-way tables)
BreslowDayTest	Breslow-Day test	TABLES	CMH (h×2×2 tables)
CMH	Cochran-Mantel-Haenszel statistics	TABLES	CMH
ChiSq	Chi-square tests	TABLES	CHISQ
CochransQ	Cochran's Q	TABLES	AGREE (h×2×2 tables)
ColScores	Column scores	TABLES	SCOROUT
CommonOddsRatioCL	Exact confidence limits for the common odds ratio	EXACT	COMOR
CommonOddsRatioTest	Common odds ratio exact test	EXACT	COMOR
CommonRelRisks	Common relative risks	TABLES	CMH (h×2×2 tables)
CrossList	Column format	TABLES	CROSSLIST



Learning ODS Table Names

```

Find ODS Table Names
The GLM Procedure
Dependent Variable: SATF1 Satisfaction With Job Characteristics

Output Added:
-----
Name: OverallANOVA
Label: Overall ANOVA
Template: stat.glm.OverallANOVA
Path: GLM.ANOVA.SATF1.OverallANOVA

Source          DF          Sum of          Mean Square    F Value    Pr > F
                Squares
Model            9      6.33919973      0.70435553      2.05    0.0428
Error           86     29.50080027      0.34303256
Corrected Total  95     35.84000000

Output Added:
-----
Name: FitStatistic
Label: Fit Statistic
Template: stat.glm.FitStatistic
Path: GLM.ANOVA.SATF1.FitStatistic

R-Square    Coeff Var    Root MSE    SATF1 Mean
0.176875    16.04630    0.585690    3.650000

Output Added:
-----
Name: ModelANOVA
Label: Type III Model ANOVA
Template: stat.glm.Tests
Path: GLM.ANOVA.SATF1.ModelANOVA

Source          DF          Type III SS      Mean Square    F Value    Pr > F
DETACHMENT      9      6.33919973      0.70435553      2.05    0.0428

Output Added:
-----
Name: ModelANOVA
Label: Type III Model ANOVA
Template: stat.glm.Tests
Path: GLM.ANOVA.SATF1.ModelANOVA

```



Using the ODS OUTPUT Destination

► Task:

- Re-run PROC GLM, but do NOT send output to the Output Window
- Capture the Contents of the
 - MODELANOVA
 - FITSTATISTICS tables as SAS Data Sets
- Re-Open Listing Destination at End of PROC GLM Step

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Using the ODS OUTPUT Destination

```
160
161 ods listing close; * <<< stop sending output to LISTING destination;
162 ods output modelanova=modelanova1(where=(hypothesistype = 1));
163 ods output fitstatistics = fit;
164 proc glm data=dnsc276.rcmp;
165 class detachment;
166 model satf1-satf4 = detachment;
167 quit;
168 ods listing; * <<< start sending output to LISTING destination;
```

PROC GLM carries out the specified analyses, but no output is “delivered” to the LISTING destination (i.e., the Output Window).

Instead, the contents of the MODELANOVA and FITSTATISTICS tables are “delivered” via the OUTPUT destination to temporary SAS data sets. A WHERE Clause SAS Data Set option is used to limit the output of rows/observations by ODS to Data Set MODELANOVA1 to just those containing the TYPE I Sums of Squares Analysis.

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Using the ODS Output Destination

```

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Introduction to Multivariate Analysis
Model Anova Data Set
  
```

Obs	Dependent	Hypothesis Type	Source	DF	SS	HS	FValue
1	SATF1	1	DETACHMENT	9	6.33919973	0.70435553	2.05
2	SATF2	1	DETACHMENT	9	4.35528003	0.48392000	0.92
3	SATF3	1	DETACHMENT	9	54.18740441	6.02982271	7.42
4	SATF4	1	DETACHMENT	9	4.43600709	0.49289968	0.99

```

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Lecture 4: Fall 2007 Semester
Introduction to Multivariate Analysis
Fitstatistics Data Set
  
```

Obs	Dependent	RSquare	CV	RootMSE	DepMean
1	SATF1	0.176875	16.04630	0.585690	3.650000
2	SATF2	0.087709	19.85037	0.725779	3.656250
3	SATF3	0.437142	22.63580	0.900716	3.979167
4	SATF4	0.093904	16.80571	0.705490	4.197917

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Using the ODS OUTPUT Destination

- Now, it becomes a relatively simple matter to join these two data sets in to one data set that contains just the variables/columns that I need for my report.

```

178= proc sort data=modelanova1;
179 by dependent;
180 run;
181
182= proc sort data=fit;
183 by dependent;
184 run;
185
186= data combine(keep = dependent source df fvalue probf rsquare depmean);
187 merge modelanova1 fit;
188 by dependent;
189 label dependent = 'Name of Dependent Variable'
190 source = 'Name of Independent Variable'
191 df = 'Degrees of Freedom'
192 probf = 'Probability Value'
193 fvalue = 'F-Statistic Value'
194 rsquare = 'R Square'
195 depmean = 'Dependent Variable Mean';
196 run;
  
```

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Using the ODS OUTPUT Destination

```

198 proc format;
199 * assign format labels to dependent variable names;
200 * note: dollar sign ($) precedes name of format associated to;
201 * values of character variables;
202 value $depvarf SATF1 = 'Satis. w/Job'
203                SATF2 = 'Satis. w/Salary & Benefits'
204                SATF3 = 'Satis. w/Command. Offcr.'
205                SATF4 = 'Satis. w/Co-Workers';
206 * assign colors to p-values;
207 value pvalf low = .0299999999 = 'green'
208                .03 -< .0999999999 = 'blue'
209                .10 - high = 'red';
210 run;
211
212 proc print data=combine label;
213 format dependent $depvarf.;
214 title5 'Combining ODS Objects in to One SAS Data Set';
215 run;

```

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Using the ODS OUTPUT Destination

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 Lecture 4: Fall 2007 Semester
 Introduction to Multivariate Analysis
 Combining ODS Objects in to One SAS Data Set

Obs	Name of Dependent Variable	Name of Independent Variable	Degrees of Freedom	F-Statistic Value	Probability Value	R Square	Dependent Variable Mean
1	Satis. w/Job	DETACHMENT	9	2.05	0.0428	0.176875	3.650000
2	Satis. w/Salary & Benefits	DETACHMENT	9	0.92	0.5131	0.087709	3.656250
3	Satis. w/Command. Offcr.	DETACHMENT	9	7.42	<.0001	0.437142	3.979167
4	Satis. w/Co-Workers	DETACHMENT	9	0.99	0.4541	0.083904	4.197917

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● ● ● | Recap: Output Destination

- Allows you to “save” Procedure-generated Data Components as SAS data sets
- Useful to select the “pieces” of your Procedure output that you need to combine/modify/join in to a single report or table.
- The more you know about the SAS Programming Language (i.e., the “Data Step”) the easier it is to work with the ODS Output Destination

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● ● ● | The PDF Destination

- “Delivers” SAS-generated output to a Portable Document File (PDF)
 - One of the most common “real-world” methods of “delivering” SAS output to non-SAS users
 - Recipient only needs the free Adobe™ Reader
 - SAS creates the PDF directly; no need to have Adobe Acrobat or other products
 - Many government agencies use PDF Destination to fulfill public reporting requirements and/or ad hoc information requests.
 - SAS Procedures “do the work” (i.e., the analyses)
 - ODS PDF destination delivers “the work” to a file that can be given to the recipient
 - Almost impossible for the recipient to change the data in the report

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The PDF Destination

```
218 ods listing close;
219 ods pdf file = 'c:\combine1.pdf' style=sasweb;
220 proc print data=combine label;
221 format dependent $depvarf.;
222 title5 'Combining ODS Objects in to One SAS Data Set';
223 run;
224 ods pdf close;
225 ods listing;
```

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The PDF Destination

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Combining ODS Objects in to One SAS Data Set

Obs	Name of Dependent Variable	Name of Independent Variable	Degrees of Freedom	F-Statistic Value	Probability Value	R Square	Dependent Variable Mean
1	Satis. w/Job	DETACHMENT	9	2.05	0.0428	0.176875	3.650000
2	Satis. w/Salary & Benefits	DETACHMENT	9	0.92	0.5131	0.087709	3.656250
3	Satis. w/Command. Offcr.	DETACHMENT	9	7.42	<.0001	0.437142	3.979167
4	Satis. w/Co-Workers	DETACHMENT	9	0.99	0.4541	0.093904	4.197917

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Controlling Output Appearance

- PROC PRINT has a very limited range of tools to control the appearance of your SAS-generated output
 - See:
 - Haworth, Lauren, “*ODS for PRINT, REPORT and TABULATE*”
 - <http://www2.sas.com/proceedings/sugi26/p003-26.pdf>
 - Lund, Pete, “*PDF Can Be Pretty Darn Fancy*”
 - <http://www2.sas.com/proceedings/sugi31/092-31.pdf>
 - Karp, Andrew, “*Getting Un-Stuck in the Traffic-Lighting*”
 - http://www.sierrainformation.com/html/past_presentations_entry.php
 - So, I will use PROC REPORT instead

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Controlling Output Appearance

- PROC REPORT
 - BASE SAS Module Procedure
 - Very powerful, has many tools and capabilities
 - Excellent resource for “customizing” the presentation of the data sets you create using the ODS Output Destination
 - ***Carpenter’s Complete Guide to the REPORT Procedure***
 - <http://www.sas.com/apps/pubscat/bookdetails.jsp?catid=1&pc=60966>

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Controlling Output Appearance

Example of an ODS Style Statement controlling how the column headers appear in the report. The Style statement overrides the SASWEB Style Template's assignment of blue as the color for the column headers.

```
226
227 options orientation=landscape;
228 ods pdf file = 'c:\pdf1.pdf' style=sasweb;
229 ods listing close;
230 proc report nowindows
231     data=combine
232     style(header)=[font_weight=bold background=black foreground=white]
233     style=sasweb split = * ;
234 column dependent source df depmean rsquare fvalue probf;
235 define dependent / display format=$depvarf. 'Dependent*Variable*Name' width=45;
236 define source / display 'Independent*Variable*Name' width=12;
237 define df / display width = 13 'Degrees*of*Freedom' width =10;
238 define depmean / display format=8.2 'Mean of*Dependent*Variable' width = 12;
239 define rsquare / display 'R-Square' width = 8 format=8.4;
240 define fvalue / display 'ANOVA*F*Statistic' width = 10;
241 define probf / display 'Prob. of*Type I*Error' width = 10;
242 title5 'Using PROC REPORT';
243 run;
244 ods pdf close;
245 ods listing;
```



Controlling Output Appearance

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Using PROC REPORT

Dependent Variable Name	Independent Variable Name	Degrees of Freedom	Mean of Dependent Variable	R-Square	ANOVA F Statistic	Prob. of Type I Error
Satis. w/Job	DETACHMENT	9	3.65	0.1769	2.05	0.0428
Satis. w/Salary & Benefits	DETACHMENT	9	3.66	0.0877	0.92	0.5131
Satis. w/Command. Offcr.	DETACHMENT	9	3.98	0.4371	7.42	<.0001
Satis. w/Co-Workers	DETACHMENT	9	4.20	0.0939	0.99	0.4541

● ● ● | Traffic-Lighting Values in Cells

- **One of the most commonly asked “how hard would it be” questions...**
 - How can we change the appearance of data in the cells of a report based on a “decision-rule”?
 - Can we do this WITHOUT manual intervention in the report generation process? Can SAS do it for us “automatically”?
 - YES!

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● ● ● | Traffic-Lighting Values in Cells

- **I created a Value Format that assigns colors to ranges of data values (see slide 31).**
- **In the next PROC REPORT “step,” an ODS Style Statement was used to “style” the column displaying the p-value. The “rules” contained in the PVALF Style Format are used to decide what color (blue, green or red) is used to display the p-value in the output report.**

42



Traffic-Lighting Values in Cells

```
247
248 options orientation=landscape;
249 ods pdf file = 'c:\pdf2.pdf' style=sasweb;
250 ods listing close;
251 proc report nowindows
252     data=combine
253     style(header)=[font_weight=bold background=black foreground=white]
254     style=sasweb split = '*';
255 column dependent source df depmean rsquare fvalue probf;
256 define dependent/display format=$depvarf. 'Dependent*Variable*Name' width=45;
257 define source/display 'Independent*Variable*Name' width=12;
258 define df / display width = 13 'Degrees*of*Freedom' width =10;
259 define depmean / display format=8.2 'Mean of*Dependent*Variable' width = 12;
260 define rsquare / display 'R-Square' width = 8 format=8.4;
261 define fvalue / display 'ANOVA*F*Statistic' width = 10;
262 define probf / display 'Prob. of*Type I*Error' width = 10
263     style(column)=[font_weight=bold foreground=pvalf.];
264 title5 'Using PROC REPORT';
265 run;
266 ods pdf close;
267 ods listing;
```

43



Traffic-Lighting Values in Cells

GWU School of Business
Decision Science 276: Exploratory and Multivariate Data Analysis
Lecture 4: Fall 2007 Semester
Introduction to Multivariate Analysis
Using PROC REPORT

Dependent Variable Name	Independent Variable Name	Degrees of Freedom	Mean of Dependent Variable	R-Square	ANOVA F Statistic	Prob. of Type I Error
Satis. w/Job	DETACHMENT	9	3.65	0.1769	2.05	0.0428
Satis. w/Salary & Benefits	DETACHMENT	9	3.66	0.0877	0.92	0.5131
Satis. w/Command. Offcr.	DETACHMENT	9	3.98	0.4371	7.42	<.0001
Satis. w/Co-Workers	DETACHMENT	9	4.20	0.0939	0.99	0.4541

44



Changing Appearance of Rows Based on Data in a Cell

- Another frequently asked “how hard would it be” question...
 - Can I have SAS “call attention” to an entire row of my output based on the value in one cell of the row?
 - Can SAS do this “automatically” so I don’t have to review my output manually every time I do an analysis or my data set changes?
 - YES!

45



Changing Appearance of Rows Based on Data in a Cell

- *COMPUTE* Block
 - Allows you to compute new columns in the report, or to test values in the columns as the PROC builds your report
 - Two Papers by Art Carpenter
 - “*Advanced PROC REPORT: Doing More in the COMPUTE Block*”
 - <http://www2.sas.com/proceedings/forum2007/242-2007.pdf>
 - “*In the COMPUTE Block: Issues Associated with Using and Naming Variables*”
 - <http://www2.sas.com/proceedings/forum2007/025-2007.pdf>
- *CALL DEFINE* Statement

46

Changing Appearance of Rows Based on Data in a Cell

```

271 options orientation=landscape;
272 ods pdf file = 'c:\pdf3.pdf' style=sasweb;
273 ods listing close;
274 proc report nowindows
275     data=combine
276     style(header)=[font_weight=bold background=gray foreground=white]
277     style=sasweb split = '*';
278 column dependent source df depmean rsquare fvalue probf;
279 define dependent/display format=Sdepvarf. 'Dependent*Variable*Name' width=45;
280 define source/display 'Independent*Variable*Name' width=12;
281 define df / display width = 13 'Degrees*of*Freedom' width =10;
282 define depmean / display format=8.2 'Mean of*Dependent*Variable' width = 12;
283 define rsquare / display 'R-Square' width = 8 format=8.4;
284 define fvalue / display 'ANOVA*F*Statistic' width = 10;
285 define probf / display 'Prob. of*Type I*Error' ;
286 compute probf;
287   if probf < .05 then do;
288     call define(_row_,"style",
289       "style=[font_weight=bold background=black foreground=white
290         font_style=italic]");
291   end;
292 endcomp;
293 titles Using PROC REPORT ;
294 run;
295 ods pdf close;
296 ods listing;

```

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Changing Appearance of Rows Based on Data in a Cell

GWU School of Business
 Decision Science 276: Exploratory and Multivariate Data Analysis
 Lecture 4: Fall 2007 Semester
 Introduction to Multivariate Analysis
 Using PROC REPORT

Dependent Variable Name	Independent Variable Name	Degrees of Freedom	Mean of Dependent Variable	R-Square	ANOVA F Statistic	Prob. of Type I Error
Satis. w/Job	DETACHMENT	9	3.66	0.1769	2.05	0.0428
Satis. w/Salary & Benefits	DETACHMENT	9	3.66	0.0877	0.92	0.5131
Satis. w/Command. Offcr.	DETACHMENT	9	3.98	0.4371	7.42	<.0001
Satis. w/Co-Workers	DETACHMENT	9	4.20	0.0939	0.99	0.4541

48



Adding Graphics Images

➤ A More Advanced ODS Example:

- Adding graphics images to the PROC REPORT output delivered as a PDF file.
- Requires a more detailed understanding of both PROC REPORT and ODS, but if you look at the code on the next slide for a while, and read the SAS user group papers I've referenced earlier, you can figure out what is going on.

49



Adding Graphics Images

```
305 ods pdf file = 'c:\pdf4.pdf' style=sasweb;
306 ods listing close;
307 proc report nowindows data=combine style=sasweb split = '*';
308   style(header)=[font_weight=bold background=gray foreground=white]
309   style(report)=
310     [preimage='C:\Documents and Settings\Andrew Karp\Desktop\DN8C276\rcmp_symbol.jpg'];
311   column dependent source df depmean rsquare tvalue probf;
312   define dependent / display format=Sdepvarf. 'Dependent*Variable*Name' width=45;
313   define source / display 'Independent*Variable*Name' width=12;
314   define df / display 'Degrees*of*Freedom' width =10 center;
315   define depmean / display format=B.2 'Mean of*Dependent*Variable' width = 12;
316   define rsquare / display 'R-Square' width = 8 format=B.4;
317   define tvalue / display 'ANOVA*F*Statistic' width = 10;
318   define probf / display 'Prob. of*Type I*Error' ;
319   compute before _page_/left
320     style=[preimage='C:\Documents and Settings\Andrew Karp\Desktop\DN8C276\rcmp_logo_e.jpg'
321       foreground=red font_weight=bold font_size=6];
322   LINE ' Royal Canadian Mounted Police';
323   endcomp;
324   compute after _page_/right
325     style=[postimage='C:\Documents and Settings\Andrew Karp\Desktop\DN8C276\rcmp_logo_f.jpg'
326       foreground=red font_weight=bold font_size=6];
327   LINE 'Gendarmerie Royal du Canada';
328   endcomp;
329   compute probf;
330     if probf < .05 then do;
331       call define(_row_, 'style',
332         'style=[font_weight=bold background=black foreground=white
333           font_style=italic]');
334     end;
335   endcomp;
336 title5 'PROC REPORT Output w/ODS & Graphics Images';
337 run;
```

50



Adding Graphics Images

GWU School of Business
Decision Science 276: Exploratory and Multivariate Data Analysis
Lecture 4: Fall 2007 Semester
Introduction to Multivariate Analysis
PROC REPORT Output w/ODS & Graphics Images



Royal Canadian Mounted Police

Dependent Variable Name	Independent Variable Name	Degrees of Freedom	Mean of Dependent Variable	R-Square	ANOVA F Statistic	Prob. of Type I Error
Satis. w/Job	DETACHMENT	9	3.65	0.1769	2.05	0.0428
Satis. w/Salary & Benefits	DETACHMENT	9	3.66	0.0877	0.92	0.5131
Satis. w/Command. Officer	DETACHMENT	9	3.98	0.4371	7.42	<.0001
Satis. w/Co-Workers	DETACHMENT	9	4.20	0.0939	0.99	0.4541

51

Gendarmerie Royale du Canada 



Highlighting Every Other Row in a Report

```
8 options orientation=landscape;
9 proc report nowindows data=sasclass.electricity headline headskip;
10 column office kwh1 kwh2 kwh3 q1kwh;
11 define office/group 'Local Office';
12 define kwh1/analysis sum 'January Revenue' Format = dollar14. width = 16;
13 define kwh2/analysis sum 'February Revenue' Format = dollar14. width = 16;
14 define kwh3/analysis sum 'March Revenue' Format = dollar14. width = 16;
15 define q1kwh/computed 'First Quarter Revenue' format=dollar14. width = 16;
16 compute q1kwh;
17   q1kwh = sum(kwh1.sum,kwh2.sum,kwh3.sum);
18   endcomp;
19 title 'Getting Un-Stuck in the Traffic-Lighting';
20 title2 'Highlighting Every Other Row in a Report';
21 run;
```

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Highlighting Every Other Row in a Report

Getting Un-Stuck in the Traffic-Lighting
Highlighting Every Other Row in a Report

Local Office	January Revenue	February Revenue	March Revenue	First Quarter Revenue
ALTURAS	\$709,272	\$620,531	\$601,945	\$1,931,648
ARCATA	\$571,650	\$507,866	\$472,250	\$1,551,766
BISHOP	\$220,883	\$208,674	\$212,709	\$642,266
CHONCHILLA	\$42,997	\$30,451	\$25,478	\$98,926
COULTERVILLE	\$37,019	\$31,123	\$29,918	\$98,060
CRESCENT CITY	\$351,653	\$309,358	\$299,731	\$960,742
FRESNO	\$142,134	\$113,751	\$95,900	\$351,785
GILROY	\$389,523	\$363,725	\$365,527	\$1,112,775
HALF MOON BAY	\$311,757	\$300,964	\$306,804	\$919,525
HANFORD	\$71,407	\$50,071	\$42,643	\$164,121
INDEPENDENCE	\$165,111	\$155,659	\$154,554	\$475,324
JACKSON	\$296,079	\$281,201	\$294,713	\$871,993
LONE PINE	\$220,367	\$204,720	\$201,623	\$626,710
MADERA	\$130,238	\$93,560	\$75,265	\$299,063
MARIPOSA	\$271,242	\$270,462	\$254,560	\$796,264
MARKLEEVILLE	\$164,496	\$144,860	\$144,257	\$453,613
MERCED	\$84,987	\$66,892	\$53,885	\$205,764
MONTEREY	\$362,506	\$342,372	\$344,096	\$1,048,974
OAKHURST	\$239,836	\$225,513	\$228,774	\$694,123
RED BLUFF	\$470,697	\$410,039	\$393,399	\$1,274,135
REDDING	\$1,339,399	\$1,045,700	\$994,417	\$3,379,536
REDFLEAY	\$54,715	\$42,439	\$37,375	\$135,129
RIPON	\$308,238	\$307,772	\$311,112	\$927,122
SALINAS	\$638,169	\$611,714	\$627,631	\$1,877,514
SANTA CRUZ	\$570,804	\$554,049	\$560,908	\$1,685,761
SELMA	\$24,763	\$22,216	\$20,900	\$67,879
SONORA	\$276,285	\$263,540	\$260,948	\$800,773
SUSANVILLE	\$283,115	\$261,944	\$259,544	\$804,603

Highlighting Every Other Row in a Report

```

23 ods listing close;
24 ods pdf file = 'C:\everyotherrow1.pdf' style=journal;
25 proc report nowindows data=sasclass.electricity headline headskip;
26 column office kwh1 kwh2 kwh3 q1kwh;
27 define office/group 'Local Office';
28 define kwh1/analysis sum 'January Revenue' Format = dollar14. width = 16;
29 define kwh2/analysis sum 'February Revenue' Format = dollar14. width = 16;
30 define kwh3/analysis sum 'March Revenue' Format = dollar14. width = 16;
31 define q1kwh/computed 'First Quarter Revenue' format=dollar14. width = 16;
32 compute q1kwh;
33   q1kwh = sum(kwh1.sum, kwh2.sum, kwh3.sum);
34   endcomp;
35 title 'Getting Un-Stuck in the Traffic-Lighting';
36 title2 'Highlighting Every Other Row in a Report';
37 run;
38 ods pdf close;
39 ods listing;

```

Highlighting Every Other Row in a Report

Getting Un-Stuck in the Traffic-Lighting
Highlighting Every Other Row in a Report

Local Office	January Revenue	February Revenue	March Revenue	First Quarter Revenue
ALTURAS	\$709,272	\$620,531	\$601,845	\$1,931,648
ARCATA	\$871,850	\$507,868	\$472,250	\$1,851,968
BISHOP	\$220,883	\$208,874	\$212,709	\$642,466
CHOWCHILLA	\$42,997	\$30,451	\$28,478	\$99,926
COULTERVILLE	\$37,019	\$31,123	\$29,918	\$98,060
CRESCENT CITY	\$351,853	\$309,358	\$299,731	\$960,942
FRESNO	\$142,134	\$113,751	\$98,900	\$354,785
GALVOY	\$383,523	\$363,725	\$368,527	\$1,115,775
HALF MOON BAY	\$311,757	\$300,064	\$308,004	\$919,825
HANFORD	\$71,407	\$50,071	\$42,843	\$164,321
INDEPENDENCE	\$165,111	\$155,859	\$154,354	\$475,324
JACKSON	\$296,079	\$281,201	\$294,713	\$871,993
LONE PINE	\$220,267	\$204,720	\$201,623	\$626,710
MADERA	\$130,238	\$93,580	\$78,285	\$299,063
MARIPOSA	\$271,242	\$270,462	\$254,560	\$796,264
MARKLEEVILLE	\$164,496	\$144,880	\$144,257	\$453,633
MERCED	\$84,887	\$68,882	\$55,885	\$209,654
MONTEREY	\$302,506	\$342,372	\$344,096	\$1,048,974
OAKHURST	\$239,836	\$225,513	\$228,774	\$694,123
RED BLUFF	\$470,697	\$410,039	\$393,399	\$1,274,135
REDDING	\$1,330,390	\$1,045,780	\$994,417	\$3,370,587
REEDLEY	\$54,716	\$42,430	\$37,975	\$135,121
RIPON	\$308,238	\$307,772	\$311,112	\$927,122
SALINAS	\$638,169	\$611,714	\$627,631	\$1,877,514
SANTA CRUZ	\$570,804	\$554,049	\$560,900	\$1,685,753
SELMA	\$24,763	\$22,216	\$20,900	\$67,879
SONORA	\$276,265	\$263,540	\$260,940	\$800,745
SUSANVILLE	\$283,115	\$281,844	\$259,544	\$824,503

55

Highlighting Every Other Row in a Report

```

41 ods listing close;
42 ods pdf file = 'C:\everyotherrow2.pdf' style=journal;
43 proc report nowindows data=sasclass.electricity headline headskip;
44 column office kwh1 kwh2 kwh3 q1kwh;
45 define office/group 'Local Office';
46 define kwh1/analysis sum 'January Revenue' Format = dollar14. width = 16;
47 define kwh2/analysis sum 'February Revenue' Format = dollar14. width = 16;
48 define kwh3/analysis sum 'March Revenue' Format = dollar14. width = 16;
49 define q1kwh/computed 'First Quarter Revenue' format=dollar14. width = 16;
50 compute q1kwh;
51   q1kwh = sum(kwh1.sum,kwh2.sum,kwh3.sum);
52   endcomp;
53 compute office;
54   count + 1;
55   * use the MOD programming lang. function to determine if COUNT is odd or even;
56   if (mod(count,2)) = 0 then do;
57     call define(_row_,'STYLE','STYLE=[background=gray foreground=white]');
58   end;
59   endcomp;
60 title 'Getting Un-Stuck in the Traffic-Lighting';
61 title2 'Highlighting Every Other Row in a Report';
62 title3 'Highlighting the Even Rows';
63 run;
64 ods pdf close;

```

Highlighting Every Other Row in a Report

Getting Un-Stuck in the Traffic-Lighting
Highlighting Every Other Row in a Report

Local Office	January Revenue	February Revenue	March Revenue	First Quarter Revenue
ALTURAS	\$708,272	\$620,531	\$601,845	\$1,931,648
ARCATA	\$571,650	\$507,866	\$472,250	\$1,551,766
BISHOP	\$220,883	\$208,674	\$212,709	\$642,266
CHOWCHILLA	\$42,997	\$30,451	\$25,478	\$98,926
COULTERVILLE	\$37,019	\$31,123	\$29,918	\$98,060
CRESCENT CITY	\$351,653	\$309,358	\$299,731	\$960,742
FRESNO	\$142,134	\$113,751	\$95,900	\$351,785
GILROY	\$383,523	\$363,725	\$365,527	\$1,112,775
HALF MOON BAY	\$311,757	\$300,964	\$306,804	\$919,525
HANFORD	\$71,407	\$50,071	\$42,843	\$164,121
INDEPENDENCE	\$165,111	\$155,659	\$154,554	\$475,324
JACKSON	\$296,079	\$281,201	\$294,713	\$871,993
LONE PINE	\$220,367	\$204,720	\$201,623	\$626,710
MADERA	\$130,238	\$93,560	\$75,285	\$299,083
MARIPOSA	\$271,242	\$270,462	\$254,560	\$796,264
MARLEEVILLE	\$194,496	\$144,860	\$144,257	\$483,613
MERCED	\$84,987	\$86,892	\$53,885	\$225,764
MONTEREY	\$382,506	\$342,372	\$344,086	\$1,068,974
OAKHURST	\$238,836	\$225,513	\$228,774	\$694,123
RED BLUFF	\$470,697	\$410,039	\$393,369	\$1,274,135
REDDING	\$1,338,399	\$1,045,780	\$994,417	\$3,379,596
REDFEY	\$54,715	\$42,439	\$37,975	\$135,129
RIPON	\$308,238	\$307,772	\$311,112	\$927,122
SALINAS	\$638,169	\$611,714	\$627,631	\$1,877,514
SANTA CRUZ	\$570,804	\$554,049	\$560,908	\$1,685,761
SELMA	\$34,763	\$22,216	\$20,900	\$77,879
SONORA	\$276,285	\$263,540	\$260,948	\$800,773
SUSANVILLE	\$283,115	\$261,944	\$259,544	\$804,603

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Highlighting Every Other Row in a Report

```

67 ods listing close;
68 ods pdf file = 'C:\everyotherrow3.pdf' style=journal;
69 proc report nowindows data=sasclass.electricity headline headskip;
70 column office kwh1 kwh2 kwh3 q1kwh;
71 define office/group 'Local Office';
72 define kwh1/analysis sum 'January Revenue' Format = dollar14. width = 16;
73 define kwh2/analysis sum 'February Revenue' Format = dollar14. width = 16;
74 define kwh3/analysis sum 'March Revenue' Format = dollar14. width = 16;
75 define q1kwh/computed 'First Quarter Revenue' Format=dollar14. width = 16;
76 compute q1kwh;
77   q1kwh = sum(kwh1.sum,kwh2.sum,kwh3.sum);
78   endcomp;
79 compute office;
80   count + 1;
81   * use the MOD programming lang. function to determine if COUNT is odd or even;
82   if NOT (mod(count,2)) = 0 then do;
83     call define(_row_,'STYLE','STYLE=[background=orange foreground=white]');
84   end;
85   endcomp;
86 title 'Getting Un-Stuck in the Traffic-Lighting';
87 title2 'Highlighting Every Other Row in a Report';
88 title3 'Highlighting the Odd Rows';
89 run;
90 ods pdf close;
91 ods listing;

```

Highlighting Every Other Row in a Report

Getting Un-Stuck in the Traffic-Lighting
 Highlighting Every Other Row in a Report
 Highlighting the Odd Rows

Local Office	January Revenue	February Revenue	March Revenue	First Quarter Revenue
ALBANY	\$10,272	\$20,511	\$99,846	\$1,511,548
ARCATA	\$571,650	\$507,866	\$472,250	\$1,551,766
BERKELEY	\$200,061	\$398,678	\$212,708	\$811,447
CHOWHILLA	\$42,997	\$30,451	\$25,478	\$98,926
CLARK COUNTY	\$37,009	\$11,323	\$29,008	\$98,000
CRESCENT CITY	\$351,653	\$309,358	\$299,731	\$960,742
ELM GROVE	\$142,134	\$153,993	\$96,300	\$392,427
GILROY	\$383,523	\$363,725	\$365,427	\$1,112,775
HALF MOON BAY	\$31,707	\$30,988	\$39,894	\$102,589
HANFORD	\$71,407	\$50,071	\$42,643	\$164,121
HAWTHORNE	\$106,111	\$104,808	\$154,254	\$365,173
JACKSON	\$296,079	\$281,201	\$294,713	\$871,993
LAUREL	\$29,387	\$24,922	\$21,623	\$75,932
MADERA	\$130,236	\$93,560	\$75,265	\$299,061
MARIPOSA	\$12,972	\$10,899	\$14,250	\$38,121
MARKLEEVILLE	\$164,496	\$144,890	\$144,257	\$453,643
MERCED	\$79,897	\$98,899	\$13,859	\$192,655
MONTEREY	\$362,506	\$342,372	\$344,096	\$1,048,974
MORNING	\$20,000	\$20,000	\$20,000	\$60,000
RED BLUFF	\$470,897	\$410,039	\$393,399	\$1,274,335
REDFORD	\$130,000	\$140,000	\$90,000	\$360,000
REEDLEY	\$54,715	\$42,439	\$37,575	\$134,729
ROCKY	\$50,000	\$107,772	\$11,112	\$168,884
SALINAS	\$638,169	\$611,714	\$627,631	\$1,877,514
SANTA CRUZ	\$50,000	\$50,000	\$50,000	\$150,000
SELMA	\$24,763	\$22,216	\$20,900	\$67,879
SERRA	\$20,000	\$20,000	\$20,000	\$60,000
SUSANVILLE	\$283,115	\$261,944	\$259,544	\$804,603

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Traffic-Lighting the Subtotals and/or Totals

```

3 options nonumber nocenter nodate orientation=landscape ps=132;
4
5 proc report nowindows data=sasclass.electricity(where=(cesched =: 'E1'))
6   headline headskip;
7   column region cesched kwh1 kwh2 kwh3 q1kwh;
8   define region/group 'Region';
9   define cesched/group 'Customer Rate Schedule' width=12;
10  define kwh1/analysis sum 'January Revenue' Format = dollar14. width = 16;
11  define kwh2/analysis sum 'February Revenue' Format = dollar14. width = 16;
12  define kwh3/analysis sum 'March Revenue' Format = dollar14. width = 16;
13  define q1kwh/computed 'First Quarter Revenue' format=dollar14. width = 16;
14  compute q1kwh;
15    q1kwh = sum(kwh1.sum,kwh2.sum,kwh3.sum);
16    endcomp;
17  break after region/summarize skip 01;
18  rbreak after/summarize dol;
19  title 'Getting Un-Stuck in the Traffic-Lighting';
20  title2 'Traffic-Lighting Sub-Totals and Totals';
21  title3 'Listing Destination Output';
22  run;

```

Traffic-Lighting the Subtotals and/or Totals

Getting Un-Stack in the Traffic-Lighting
Traffic-Lighting Sub-Totals and Totals
Listing Destination Output

Region	Customer Rate Schedule	January Revenue	February Revenue	March Revenue	First Quarter Revenue
EASTERN	E1	\$1,915,215	\$1,818,619	\$1,825,089	\$5,558,923
	E1L	\$102,096	\$98,659	\$100,294	\$301,049
	E1M	\$117,191	\$120,687	\$112,326	\$350,204
	E1T	\$152,800	\$160,640	\$162,400	\$475,840
		\$45,600	\$44,960	\$39,200	\$129,760
EASTERN		\$2,332,902	\$2,243,565	\$2,239,309	\$6,815,776
NORTHERN	E1	\$2,731,394	\$2,370,025	\$2,266,295	\$7,367,714
	E1C	\$26,560	\$21,665	\$19,020	\$67,245
	E1L	\$220,113	\$189,409	\$174,325	\$583,847
	E1M	\$85,663	\$85,461	\$84,229	\$255,353
		\$8,721	\$7,917	\$7,260	\$23,898
NORTHERN		\$3,072,451	\$2,674,477	\$2,551,129	\$8,298,057
SOUTHERN	E1	\$433,796	\$323,757	\$273,901	\$1,031,454
	E1C	\$13,158	\$11,157	\$6,465	\$30,780
	E1L	\$57,316	\$47,512	\$46,540	\$145,368
		\$5,433	\$4,809	\$3,411	\$13,653
SOUTHERN		\$509,703	\$387,235	\$324,317	\$1,221,255
WESTERN	E1	\$1,925,220	\$1,847,294	\$1,869,383	\$5,641,897
	E1C	\$5,068	\$2,555	\$2,576	\$10,199
	E1L	\$123,016	\$120,739	\$120,122	\$363,877
		\$102,071	\$95,653	\$102,364	\$300,088
WESTERN		\$2,155,375	\$2,066,241	\$2,094,445	\$6,316,061
		=====	=====	=====	=====
		\$8,070,431	\$7,371,518	\$7,209,200	\$22,651,149

61

Traffic-Lighting the Subtotals and/or Totals

```

24 ods listing close;
25 ods pdf file = 'c:\totals1.pdf' style=journal;
26 proc report nowindows data=sasclass.electricity(where=(cesched = 'E1'))
27   headline headskip;
28   column region cesched kwh1 kwh2 kwh3 q1kwh;
29   define region/group 'Region';
30   define cesched/group 'Customer Rate Schedule' width=12;
31   define kwh1/analysis sum 'January Revenue' Format = dollar14. width = 16;
32   define kwh2/analysis sum 'February Revenue' Format = dollar14. width = 16;
33   define kwh3/analysis sum 'March Revenue' Format = dollar14. width = 16;
34   define q1kwh/computed 'First Quarter Revenue' format=dollar14. width = 16;
35   compute q1kwh;
36     q1kwh = sum(kwh1.sum,kwh2.sum,kwh3.sum);
37   endcomp;
38 * assign style attributes to the subtotals and totals;
39 break after region/summarize skip 01
40   style=[foreground=white background=blue font_weight=bold];
41 rbreak after/summarize dol
42   style=[foreground=white background=red font_weight=bold];
43 title 'Getting Un-Stack in the Traffic Lighting';
44 title2 'Traffic-Lighting Sub-Totals and Totals';
45 title3 'PDF Destination Output with Subtotals and Totals Highlighted';
46 run;
47 ods pdf close;
48 ods listing;

```

62

Traffic-Lighting the Subtotals and/or Totals

Getting Un-Stuck in the Traffic-Lighting
Traffic-Lighting Sub-Totals and Totals
PDF Destination Output with Subtotals and Totals Highlighted

Region	Customer Rate Schedule	January Revenue	February Revenue	March Revenue	First Quarter Revenue
EASTERN	E1	\$1,915,215	\$1,818,619	\$1,825,089	\$5,558,923
	E1L	\$102,096	\$98,659	\$100,294	\$301,049
	E1M	\$117,191	\$120,687	\$112,326	\$350,204
	E1S	\$152,800	\$160,640	\$162,400	\$475,840
	E1T	\$45,600	\$44,960	\$39,200	\$129,760
EASTERN		\$2,332,902	\$2,243,565	\$2,230,309	\$6,615,776
NORTHERN	E1	\$2,731,394	\$2,370,025	\$2,266,295	\$7,367,714
	E1C	\$26,580	\$21,665	\$19,020	\$67,245
	E1L	\$220,113	\$189,409	\$174,325	\$583,847
	E1M	\$85,663	\$85,461	\$94,229	\$255,353
	E1T	\$8,721	\$7,917	\$7,260	\$23,898
NORTHERN		\$3,072,451	\$2,674,477	\$2,551,129	\$8,298,057
SOUTHERN	E1	\$433,796	\$323,757	\$273,901	\$1,031,454
	E1C	\$13,158	\$11,157	\$6,465	\$30,780
	E1L	\$57,316	\$47,512	\$40,540	\$145,368
	E1M	\$5,433	\$4,809	\$3,411	\$13,653
SOUTHERN		\$509,703	\$387,235	\$324,317	\$1,221,255
WESTERN	E1	\$1,925,220	\$1,847,294	\$1,869,383	\$5,641,897
	E1C	\$5,068	\$2,555	\$2,576	\$10,199
	E1L	\$123,016	\$120,739	\$120,122	\$363,877
	E1M	\$102,071	\$95,653	\$102,364	\$300,088
WESTERN		\$2,155,375	\$2,066,241	\$2,094,445	\$6,316,061
		\$8,070,431	\$7,371,518	\$7,209,200	\$22,651,149

63

Exporting SAS Procedure Output to CSV Files

➤ CSV (Comma-Separated Values) ODS Destination

- Creates text files in CSV format from ODS output tables
- One of many ways to move SAS procedure-generated output to file types that can be read by Microsoft products such as Excel and Word

64



Exporting SAS Procedure Output to CSV Files

➤ Example:

- Output parameter estimates from a multiple regression analysis generated by PROC REG to a CSV file
 - Then, open the CSV file in EXCEL
 - SAS 8: CSV Destination
 - Writes only the body of the output to the CSV file
 - SAS 9: CSVALL Destination
 - Titles/footnotes/by-lines are also written to the CSV file

65



Exporting SAS Procedure Output to CSV Files

```
62 ods select parameterestimates;  
63 proc reg data=sasclass.regressdata;  
64 model depvar = y1-y7;  
65 title 'Exchaging Data from SAS to Microsoft';  
66 title2 'Creating CSV Files from SAS Procedure-Generated Output';  
67 run;
```

66



Exporting SAS Procedure Output to CSV Files

Exchanging Data from SAS to Microsoft
Creating CSV Files from SAS Procedure-Generated Output

The REG Procedure
Model: MODEL1
Dependent Variable: DEPVAR Dependent Variable

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	630.79485	450.14931	1.40	0.1685
Y1	Indep Var 1	1	0.27183	0.51595	0.53	0.6011
Y2	Indep Var 2	1	0.97863	0.37231	2.63	0.0119
Y3	Indep Var 3	1	-1.01370	0.62189	-1.63	0.1106
Y4	Indep Var 4	1	-0.77425	0.66169	-1.17	0.2486
Y5	Indep Var 5	1	0.15735	0.58337	0.27	0.7887
Y6	Indep Var 6	1	-0.98877	0.55305	-1.79	0.0810
Y7	Indep Var 7	1	13.80626	1.58775	8.70	<.0001

67



Exporting SAS Procedure Output to CSV Files

```
62  
63 ods select parameterestimates;  
64 ods listing close; * no output to listing destination;  
65 ods csv file = 'C:\datatransfer\parms1.csv';  
66 * note: CSVALL available in SAS 9;  
67 ods csvall file = 'C:\datatransfer\parms2.csv';  
68 proc reg data=sasclass.regressdata;  
69 model depvar = y1-y7;  
70 title 'Exchanging Data from SAS to Microsoft';  
71 title2 'Creating CSV Files from SAS Procedure-Generated Output';  
72 quit;  
73 ods csv close;  
74 ods csvall close;  
75 ods listing; * re-open listing destination;
```

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Exporting SAS Procedure Output to CSV Files

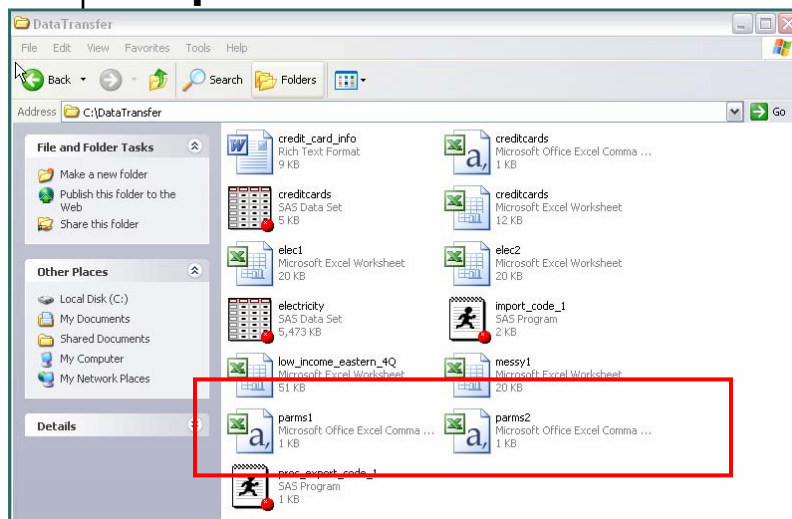
```
528 ods select parameterestimates;
529 ods listing close; * no output to listing destination;
530 ods csv file = 'C:\datatransfer\parms1.csv';
NOTE: Writing CSV Body file: C:\datatransfer\parms1.csv
531 * note: CSUALL available in SAS 9;
532 ods csvall file = 'C:\datatransfer\parms2.csv';
NOTE: Writing CSUALL Body file: C:\datatransfer\parms2.csv
533 proc reg data=sasclass.regressdata;
534 model depvar = y1-y7;
535 title 'Exchanging Data from SAS to Microsoft';
536 title2 'Creating CSV Files from SAS Procedure-Generated Output';
537 quit;

NOTE: PROCEDURE REG used (Total process time):
      real time      0.12 seconds
      cpu time       0.04 seconds

538 ods csv close;
539 ods csvall close;
540 ods listing; * re-open listing destination;
```

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Exporting SAS Procedure Output to CSV Files





Exporting SAS Procedure Output to CSV Files

```
param1 - Notepad
File Edit Format View Help
"Parameter Estimates"
"Variable","Label","DF","ParameterEstimate","StandardError","t value","Pr > |t|"
"Intercept","Intercept","1",630.79485,450.14931,1.40,0.1685
"Y1","Indep Var 1","1",0.27183,0.51595,0.53,0.6011
"Y2","Indep Var 2","1",0.97863,0.37231,2.63,0.0119
"Y3","Indep Var 3","1",-1.01370,0.62189,-1.63,0.1106
"Y4","Indep Var 4","1",-0.77425,0.66169,-1.17,0.2486
"Y5","Indep Var 5","1",0.15735,0.58337,0.27,0.7887
"Y6","Indep Var 6","1",-0.98877,0.55305,-1.79,0.0810
"Y7","Indep Var 7","1",13.80626,1.58775,8.70,<.0001"
```

Parameter Estimates Table Saved as a CSV File using the ODS CSV Destination

71



Exporting SAS Procedure Output to CSV Files

	A	B	C	D	E	F	G
1	Parameter Estimates						
2	Variable	Label	DF	ParameterEstimate	StandardError	t Value	Pr > t
3	Intercept	Intercept	1	630.79485	450.14931	1.4	0.1685
4	Y1	Indep Var 1	1	0.27183	0.51595	0.53	0.6011
5	Y2	Indep Var 2	1	0.97863	0.37231	2.63	0.0119
6	Y3	Indep Var 3	1	-1.0137	0.62189	-1.63	0.1106
7	Y4	Indep Var 4	1	-0.77425	0.66169	-1.17	0.2486
8	Y5	Indep Var 5	1	0.15735	0.58337	0.27	0.7887
9	Y6	Indep Var 6	1	-0.98877	0.55305	-1.79	0.081
10	Y7	Indep Var 7	1	13.80626	1.58775	8.7	<.0001

CSV Destination Output Opened in Excel

72



Exporting SAS Procedure Output to CSV Files

```
param1 - Notepad
File Edit Format View Help
"Parameter Estimates"
"Variable","Label","DF","ParameterEstimate","StandardError","t value","Pr > |t|"
"Intercept","Intercept","1",630.79485,450.14931,1.40,0.1685
"Y1","Indep Var 1","1",0.27183,0.51595,0.53,0.6011
"Y2","Indep Var 2","1",0.97863,0.37231,2.63,0.0119
"Y3","Indep Var 3","1",-1.01370,0.62189,-1.63,0.1106
"Y4","Indep Var 4","1",-0.77425,0.66169,-1.17,0.2486
"Y5","Indep Var 5","1",0.15735,0.58337,0.27,0.7887
"Y6","Indep Var 6","1",-0.98877,0.55305,-1.79,0.0810
"Y7","Indep Var 7","1",13.80626,1.58775,8.70,<.0001"
```

Parameter Estimates Table Saved as a CSV File using the ODS CSV Destination

73



Exporting SAS Procedure Output to CSV Files

	A	B	C	D	E	F	G	H
1	Exchanging Data from SAS to Microsoft							
2								
3	Creating CSV Files from SAS Procedure-Generated Output							
4								
5	The REG Procedure							
6	Model: MODEL1							
7	Dependent Variable: DEPVAR Dependent Variable							
8	Parameter Estimates							
9	Variable	Label	DF	ParameterEstimate	StandardError	t Value	Pr > t	
10	Intercept	Intercept	1	630.79485	450.14931	1.4	0.1685	
11	Y1	Indep Var 1	1	0.27183	0.51595	0.53	0.6011	
12	Y2	Indep Var 2	1	0.97863	0.37231	2.63	0.0119	
13	Y3	Indep Var 3	1	-1.0137	0.62189	-1.63	0.1106	
14	Y4	Indep Var 4	1	-0.77425	0.66169	-1.17	0.2486	
15	Y5	Indep Var 5	1	0.15735	0.58337	0.27	0.7887	
16	Y6	Indep Var 6	1	-0.98877	0.55305	-1.79	0.081	
17	Y7	Indep Var 7	1	13.80626	1.58775	8.7	<.0001	
18								

CSVALL Destination Output Opened in Excel

74

Exporting SAS Procedure Output to CSV Files

```

Exchanging Data from SAS to Microsoft
Creating CSV Files from SAS Procedure-Generated Output

The REG Procedure
Model: MODEL1
Dependent Variable: DEPVAR Dependent Variable
Parameter Estimates
"Variable", "Label", "DF", "ParameterEstimate", "StandardError", "t Value", "Pr > |t|"
"Intercept", "Intercept", "1", 630.79485, 450.14931, 1.40, 0.1685
"Y1", "Indep Var 1", "1", 0.27183, 0.51595, 0.53, 0.6011
"Y2", "Indep Var 2", "1", 0.97863, 0.37231, 2.63, 0.0119
"Y3", "Indep Var 3", "1", -1.01370, 0.62189, -1.63, 0.1106
"Y4", "Indep Var 4", "1", -0.77425, 0.66169, -1.17, 0.2486
"Y5", "Indep Var 5", "1", 0.15735, 0.58337, 0.27, 0.7887
"Y6", "Indep Var 6", "1", -0.98877, 0.55305, -1.79, 0.0810
"Y7", "Indep Var 7", "1", 13.80626, 1.58775, 8.70, <.0001"

```

Parameter Estimates Table Saved as a CSV File
using the ODS CSVALL Destination

75

Exporting SAS Procedure Output to CSV Files

	A	B	C	D	E	F	G	H
1	Exchanging Data from SAS to Microsoft							
2								
3	Creating CSV Files from SAS Procedure-Generated Output							
4								
5	The REG Procedure							
6	Model: MODEL1							
7	Dependent Variable: DEPVAR Dependent Variable							
8	Parameter Estimates							
9	Variable	Label	DF	ParameterEstimate	StandardError	t Value	Pr > t	
10	Intercept	Intercept	1	630.79485	450.14931	1.4	0.1685	
11	Y1	Indep Var 1	1	0.27183	0.51595	0.53	0.6011	
12	Y2	Indep Var 2	1	0.97863	0.37231	2.63	0.0119	
13	Y3	Indep Var 3	1	-1.0137	0.62189	-1.63	0.1106	
14	Y4	Indep Var 4	1	-0.77425	0.66169	-1.17	0.2486	
15	Y5	Indep Var 5	1	0.15735	0.58337	0.27	0.7887	
16	Y6	Indep Var 6	1	-0.98877	0.55305	-1.79	0.081	
17	Y7	Indep Var 7	1	13.80626	1.58775	8.7	<.0001	
18								

CSVALL Destination Output Opened in Excel

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Using the SAS HTML Destination to Create Files that Can Be Opened In Excel

- One of the most common ways to move SAS procedure-generated output in to a file that can be opened in Excel
- Although we use XLS as the file extension, SAS is creating an HTML file that is *opened* by Excel
 - You need to do “File...Save As...Workbook” in order to make it a “real” Excel Spreadsheet

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Using the SAS HTML Destination to Create Files that Can Be Opened In Excel

- **Benefits:**
 - Very easy to implement
 - Small increase in coding on the SAS “side” results in a nice-looking Excel-readable file
 - Style Templates and ODS STYLE statements can be used to customize appearance of the file
 - But, there are some drawbacks:
 - Only one worksheet at a time
 - SAS “thinks” like it is creating an HTML file, which is really what it is doing

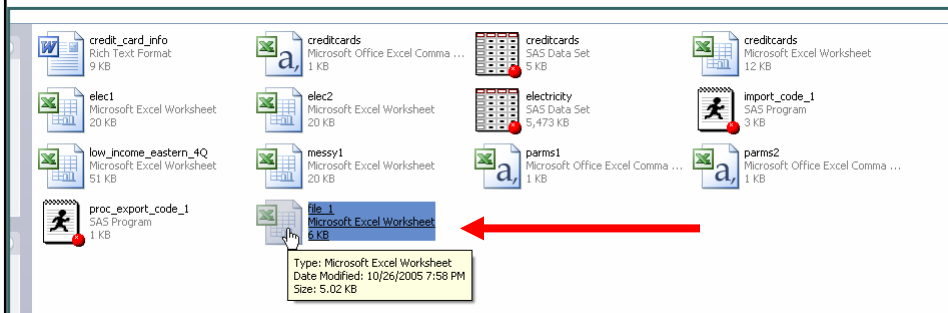
78

Using the SAS HTML Destination to Create Files that Can Be Opened In Excel

```
80 ods select parameterestimates;
81 ods listing close; * no output to listing destination;
82 ods html file = 'C:\datatransfer\file_1.xls' style=minimal;
83 proc reg data=sasclass.regressdata;
84 model depvar = y1-y7;
85 title 'Exchaging Data From SAS to Microsoft';
86 title2 'Creating Excel-Readable Files from SAS Procedure-Generated Output';
87 title3 'Using the HTML Destination and MINIMAL Style Template';
88 quit;
89 ods html close;
90 ods listing; * re-open listing destination;
```

79

Using the SAS HTML Destination to Create Files that Can Be Opened In Excel



80

Using the SAS HTML Destination to Create Files that Can Be Opened In Excel

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	630.79485	450.14931	1.4	0.1685
Y1	Indep Var 1	1	0.27183	0.51595	0.53	0.6011
Y2	Indep Var 2	1	0.97863	0.37231	2.63	0.0119
Y3	Indep Var 3	1	-1.0137	0.62189	-1.63	0.1106
Y4	Indep Var 4	1	-0.77425	0.66169	-1.17	0.2486
Y5	Indep Var 5	1	0.15735	0.58337	0.27	0.7887
Y6	Indep Var 6	1	-0.98877	0.55305	-1.79	0.081
Y7	Indep Var 7	1	13.80626	1.58775	8.7	<.0001

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Using the SAS HTML Destination to Create Files that Can Be Opened In Excel

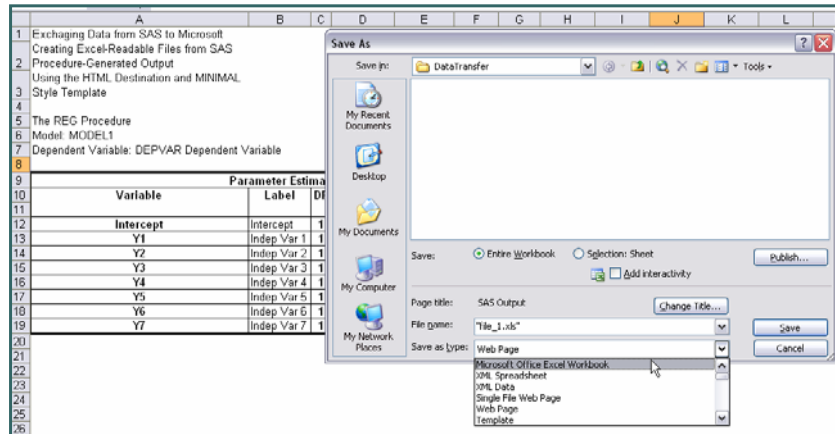
The screenshot shows a 'Save As' dialog box overlaid on a spreadsheet. The dialog box has the following fields and options:

- Save in: DataTransfer
- Save: Entire Workbook Selection: Sheet
- Page title: SAS Output
- File name: Title_1_081
- Save as type: Web Page

A red arrow points to the 'Web Page' option in the 'Save as type' dropdown menu.

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Using the SAS HTML Destination to Create Files that Can Be Opened In Excel



83

ODS Style Templates

- How can I learn which Style Templates are available where I SAS Software?

```
360 proc template;  
361     list styles;  
362 run;
```

84



Using ODS Styles in Version 8

Advanced Reporting with ODS
Styles Available in SAS V8
Listing of: SASHELP.TMPLMST
Path Filter is: Styles
Sort by: PATH/ASCENDING

Obs	Path	Type
1	Styles	Dir
2	Styles.BarrettsBlue	Style
3	Styles.Beige	Style
4	Styles.Brick	Style
5	Styles.Brown	Style
6	Styles.D3d	Style
7	Styles.Default	Style
8	Styles.Minimal	Style
9	Styles.NoFontDefault	Style
10	Styles.Printer	Style
11	Styles.Rtf	Style
12	Styles.Sasweb	Style
13	Styles.Statdoc	Style
14	Styles.Theme	Style
15	Styles.fancyPrinter	Style
16	Styles.sansPrinter	Style
17	Styles.sasdocPrinter	Style
18	Styles.serifPrinter	Style

SAS-Supplied Styles in
Version 8. Additional Styles
have been added in SAS 9
(see next page)

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SAS-Supplied ODS Styles in SAS 9.1.3

The SAS System
Listing of: SASHELP.TMPLMST
Path Filter is: Styles
Sort by: PATH/ASCENDING

Obs	Path	Type
1	Styles	Dir
2	Styles.Analysis	Style
3	Styles.Astronomy	Style
4	Styles.Banker	Style
5	Styles.BarrettsBlue	Style
6	Styles.Beige	Style
7	Styles.Brick	Style
8	Styles.Brown	Style
9	Styles.Dave	Style
10	Styles.D3d	Style
11	Styles.Default	Style
12	Styles.EDDefault	Style
13	Styles.Education	Style
14	Styles.Electronics	Style
15	Styles.Festival	Style
16	Styles.FestivalPrinter	Style
17	Styles.Gears	Style
18	Styles.Journal	Style
19	Styles.Magnify	Style
20	Styles.Meadow	Style
21	Styles.MeadowPrinter	Style
22	Styles.Minimal	Style
23	Styles.Money	Style
24	Styles.NoFontDefault	Style
25	Styles.Normal	Style
26	Styles.NormalPrinter	Style
27	Styles.Printer	Style
28	Styles.Ramp	Style
29	Styles.Rtf	Style
30	Styles.Sasweb	Style
31	Styles.Science	Style
32	Styles.Seaside	Style
33	Styles.SeasidePrinter	Link
34	Styles.Sketch	Style
35	Styles.Statdoc	Style
36	Styles.Statistical	Style
37	Styles.Theme	Style
38	Styles.Torn	Style
39	Styles.Meteorcolor	Style
40	Styles.blockPrint	Style
41	Styles.fancyPrinter	Style
42	Styles.sansPrinter	Style
43	Styles.sasdocPrinter	Style
44	Styles.serifPrinter	Style

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How Can I Create My Own Style Templates?

➤ PROC TEMPLATE

- See Haworth, Lauren: “**SAS with STYLE: Creating Your Own Style Templates,**”
 - SAS Global Forum on-line proceedings tool
 - www.SASGlobalForum.org

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What Are Some Other Tools To Move Data from SAS to Excel?

➤ XML Destination

- EXCELXP Tagset

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Thanks for Inviting Me Back to DCSUG !

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sierrainfo@aol.com
- Web site: <http://www.sierrainformation.com>