

How to Make ODS Statistical Graphics Work for You

Presented By:

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The Output Delivery System

- New to Version 8 of the SAS System
 - Was added to the SAS System in V7, but this Version was not around for very long
- Set of tools to control the delivery of SAS-generated output
- Prior to Version 8 all Procedure-generated output was rendered as text and placed in the Output Window
 - Very little user control over content or display
 - Often difficult to capture Procedure-generated output as SAS data sets
 - **Prior to Version 8, the Procedure generated the output**

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Intro. to ODS SAS 9 Statistical Graphics

- New to SAS 9.1
 - Experimental
 - Capabilities, Features and Syntax Likely to Change Before “Production” Designation
 - Extension of ODS to about 30 PROCs
 - Mainly in STAT and ETS Modules, one in BASE, one in HPF
 - Not the same as, or a replacement for SAS/GRAPH®
 - My Impressions, so far:
 - Great tools and a major enhancement to the analytic procedures
 - It's either really easy or really hard to use ODS Stat Graphics

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The Output Delivery System

- Now, in Version 8:
 - SAS PROCs that can generate output to the Output Window “support the Output Delivery System.” This means
 - Their output is rendered as a series of “output objects”
 - Output objects are rendered as a function of their
 - **Data component** (the output generated by the PROC)
 - **Table component** (rules for rendering data component)
 - » Table Template
 - » Style Template
 - Output objects are sent by SAS to ODS **destinations**
 - *The appearance of the output is controlled by:*
 - *The table template*
 - *The style template*

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The Output Delivery System

- More on ODS Destinations
 - The **default** destination is **LISTING**
 - If you do nothing, all output is sent to the Output Window, just like in previous releases of SAS System software.
 - ODS Statements control
 - Which destinations are open/closed
 - What will be output to the destination
 - How the output will be portrayed/rendered
 - SAS continues to add new destinations to ODS
 - PDF (new in Release 8.1)
 - XML (experimental in Release 8.2, is production in SAS 9)
 - CSV (experimental in Release 8.2, is production in SAS 9)
 - DOCUMENT (Production in SAS 9)

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The Output Delivery System

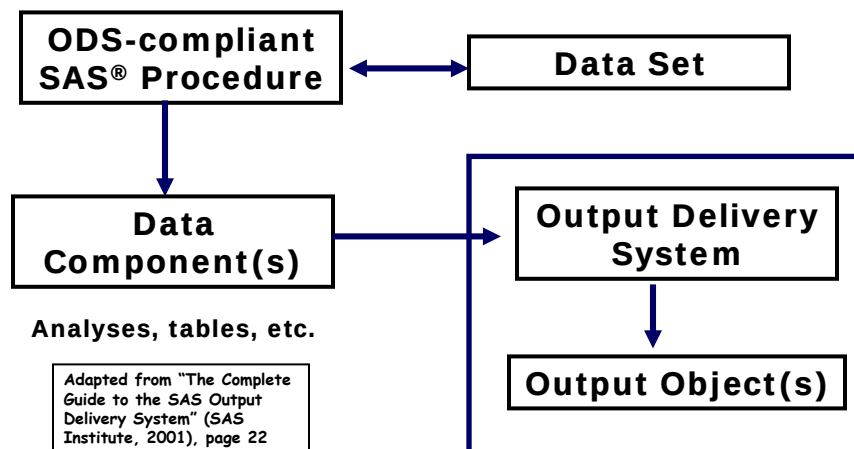
An overview of how ODS works

- Procedure generates **Data Component** and sends to ODS
- Data Component and Table Definitions are bound by the ODS to form an **Output Object**
- Output objects are then sent (“rendered”) by the ODS to the specified **Destinations**

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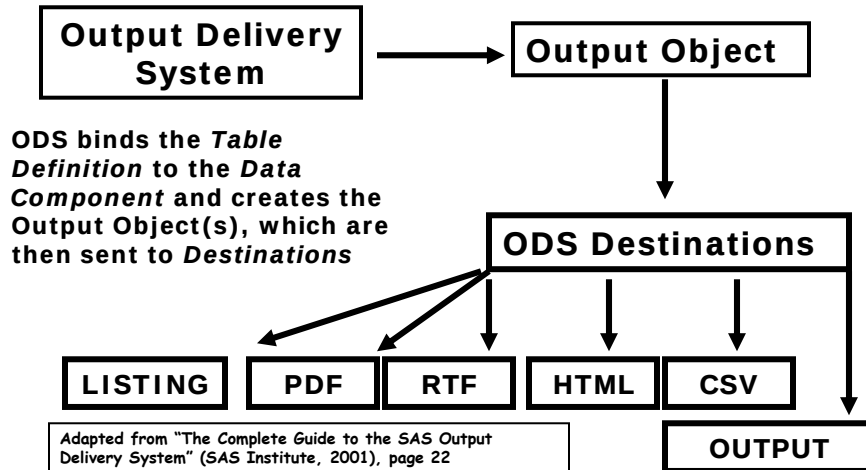
How Does the Output Delivery System Work?



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How Does the Output Delivery System Work?



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ODS Statistical Graphics

- Experimental in SAS 9.1
 - 30 BASE, STAT and ETS Module Procedures Support ODS Statistical Graphics
 - Tools to generate graphical analysis/displays from Procedures
 - Independent of SAS/GRAPH: *not* required to use ODS Statistical Graphics
 - Extension of ODS to include objects that can create graphs which are delivered to supported destinations
 - DOCUMENT, HTML, LATEX, PCL, PDF, PS, RTF
 - New Styles in SAS 9.1 for Stat Graphics
 - Analysis, Journal & Statistical (Default also works with Stat Graphics)

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ODS Statistical Graphics

- PROCEDURES Supporting STAT Graphics in 9.1
 - **BASE**
 - CORR
 - **STAT**
 - ANOVA, BOXPLOT, CORRESP, GAM, GENMOD, GLM, KDE, LIFETEST,
 - LOESS, LOGISTIC, MI, MIXED, PHREG, PRINCOMP, PRINQUAL, ROBUSTREG, REG
 - **ETS**
 - ARIMA, AUTOREG, ENTROPY, EXPAND, MODEL, SYSLIN, TIMESERIES, UCM, VARMAX, X12
 - **HPF** (High Performance Forecasting)
 - HPF

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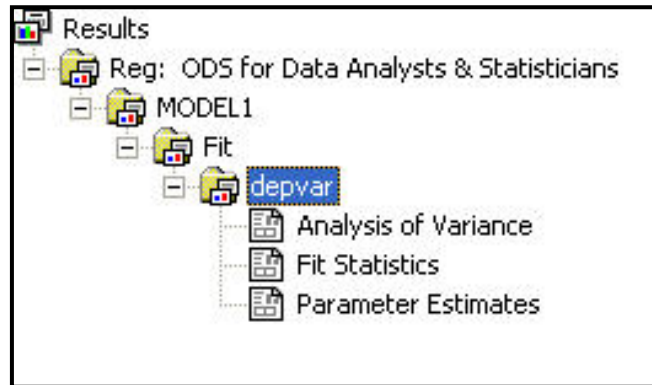
Understanding Tables, Objects and Destinations

```
OPTIONS nonumber nodate nocenter;  
* example 1: output objects;  
Proc Reg Data=SUGI28.regressdata;  
Model Depvar = Y1;  
title1 'ODS for Data Analysts & Statisticians';  
title2 'Objects and Destinations';  
title3 'Default PROC REG Output: Simple Regression Model';  
quit;
```

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Understanding Tables, Objects and Destinations



RESULTS Window. By default, ODS has sent the output objects generated from the PROC REG output to the default LISTING (Output Window) Destination.

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Understanding Tables, Objects and Destinations

ODS for Data Analysts & Statisticians
 Objects and Destinations
 Default PROC REG Output: Simple Regression Model

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

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	53214978	53214978	19.86	<.0001
Error	48	128603425	2679238		
Corrected Total	49	181818403			

Root MSE 1636.83781 R-Square 0.2927
 Dependent Mean 2109.38640 Adj R-Sq 0.2779
 Coeff Var 77.59782

Parameter Estimates

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	96.71848	507.47788	0.19	0.8497
X1	Indep Var 1	1	4.92220	1.10446	4.46	<.0001

Listing Destination (Output Window). What we're used to seeing.

Listing Destination (Output Window). What we're used to seeing.

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How Hard Would It Be?

- Generate Scatterplots to provide graphic assessment of the model's fit to the data under analysis.
- Old Way: Have PROC REG create and output data set, and then use either PROC PLOT or PROC GPLOT to create the desired graphics.
- Here is an example

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Stat Graphics the "Old" Way

```
3 * why ODS Stat Graphics?;
4
5 Proc reg data=sasclass.regressdata noprint;
6 model depvar = y1;
7 output out=new p = predictval r=residval cookd=cookdval;
8 quit;
9
10 title 'Intro to SAS(r) ODS Stat Graphics';
11 title2 'Why Do We Need Stat Graphics?';
12
13 * add an observation number;
14 data new;
15     set new;
16     obsno = _n_;
17 run;
18
19 Proc print data=new(obs=20);
20 var depvar y1 predictval residval cookdval;
21 title3 'Data Set Created by PROC Reg';
22 title4 'First 20 Observations';
23 run;
```

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Stat Graphics the "Old" Way

Data Set Created by PROC Reg

Data Set Created by PROC Reg

First 20 Observations

Obs	DEPVAR	Y1	predictval	residval	cookdval
1	182.61	158.00	874.43	-691.82	0.004802
2	180.23	379.00	1962.23	-1782.00	0.012603
3	284.55	250.00	1327.27	-1042.72	0.006813
4	164.38	365.60	1896.28	-1731.90	0.012175
5	267.38	67.50	428.97	-161.59	0.000414
6	199.92	58.30	383.68	-183.76	0.000561
7	999.09	381.89	1976.46	-977.37	0.003777
8	1489.50	346.63	1802.90	-313.40	0.000417
9	931.84	341.92	1779.72	-847.88	0.003092
10	1103.24	491.42	2515.59	-1412.35	0.009011
11	1387.82	411.58	2122.60	-734.78	0.002099
12	944.21	412.63	2127.77	-1183.56	0.005446
13	2628.32	435.24	2239.06	389.26	0.000599
14	1891.70	406.67	2098.43	-206.73	0.000166
15	2268.06	510.33	2608.67	-340.61	0.000562
16	3036.63	502.33	2569.29	467.34	0.001026
17	3559.92	470.88	2414.49	1145.43	0.005565
18	2227.76	541.32	2761.21	-533.45	0.001573
19	1845.89	493.00	2523.37	-677.48	0.002085
20	3115.29	229.58	1226.76	1888.53	0.024740

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Stat Graphics the "Old" Way

```

25 options ls=64 nocenter nonumber nodate;
26 ods rtf file='statgraph1.rtf' style=default bodytitle;
27 proc plot data=new;
28 plot depvar*y1 = '*';
29 title4 'Plot of Depvar by Y1';
30 run;
31 plot depvar*y1 = 'A'
32     predictval*y1 = 'P'/OVERLAY;
33 title3 'Overlay Plot of Actual and Predicted Values';
34 title4 'of Dependent Variable';
35 run;
36 plot cookdval * obsno = '*';
37 title3 'Plot of Cooks Distance Criterion by Observation Number';
38 run;
39 plot residval*obsno = '*';
40 title3 'Plot of Residual by Observation Number';
41 run;
42 quit;
43 ods rtf close;

```

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Stat Graphics the "New" Way

```

45 ods listing close;
46 * Listing Dest. Does Not Support ODS STAT GRAPHICS;
47 * Enable ODS Graphics;
48 ods graphics; ←
49 ods rtf file='C:\statgraph1.rtf' bodytitle style=default;
50 title1 'Intro to ODS Statistical Graphics';
51 title2 'Default Stat Graphics';
52 title3 'Diagnostic Panels Plot from ODS Stat Graphics';
53 proc reg data=sasclass.regressdata;
54 model depvar=y1;
55 quit;
56 * close graphics;
57 ods graphics off; ←
58 ods listing;
59 * close RTF destination;
60 ods rtf close;

```

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Stat Graphics the "New" Way

Intro to ODS Statistical Graphics
 Default Stat Graphics
 Diagnostic Panels Plot from ODS Stat Graphics

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

Number of Observations Read	50
Number of Observations Used	50

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	53214978	53214978	19.86	<.0001
Error	48	128603425	2679238		
Corrected Total	49	181818403			

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Stat Graphics the "New" Way

Root MSE	1636.83781	R-Square	0.2927
Dependent Mean	2109.38640	Adj R-Sq	0.2779
Coeff Var	77.59782		

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	96.71848	507.47788	0.19	0.8497
Y1	Indep Var 1	1	4.92220	1.10446	4.46	<.0001

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ODS Stat Graphics the "New" Way

Intro to ODS Statistical Graphics

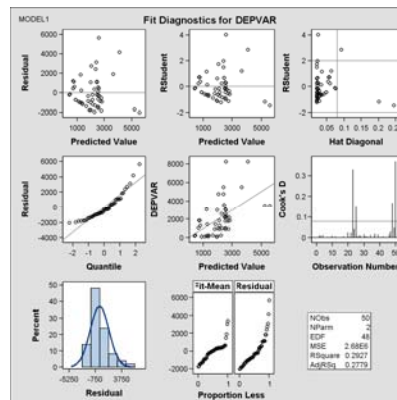
Default Stat Graphics

Diagnostic Panels Plot from ODS Stat Graphics

The REG Procedure

Model: MODEL1

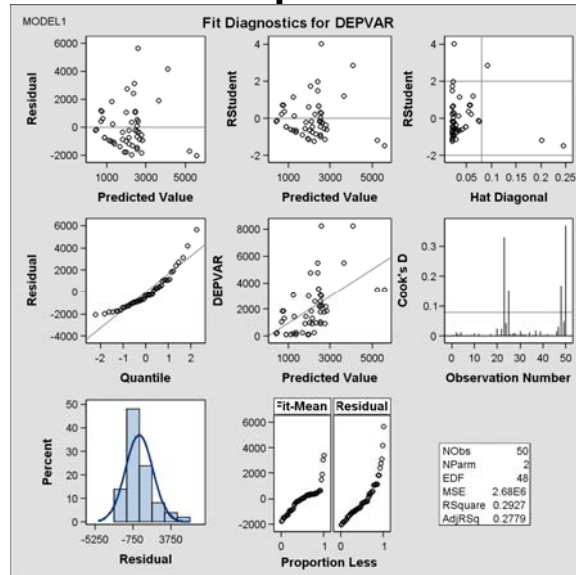
Dependent Variable: DEPVAR



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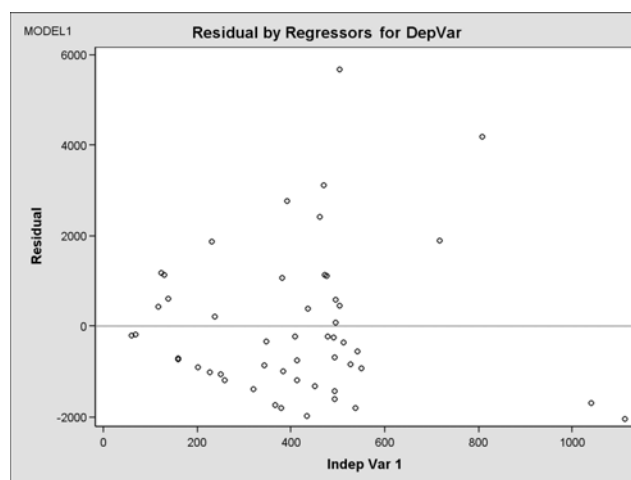
ODS Stat Graphics the "New" Way



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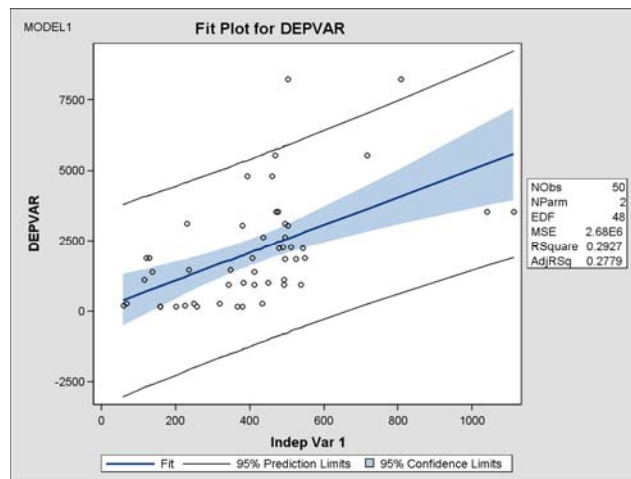
ODS Stat Graphics the "New" Way



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ODS Stat Graphics the "New" Way



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What Happened?

- PROC REG created additional data components and supplied them to ODS
- ODS then created Graphics Objects from those data components and delivered them to the RTF destination.
- SAS/GRAPH was NOT used to create these graphics!

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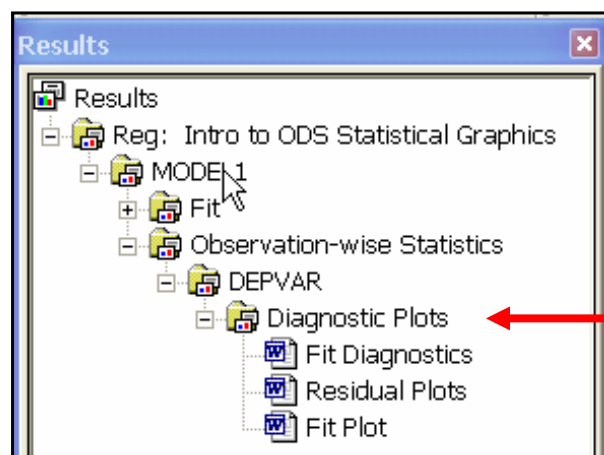
What Happened?

- Some more details:
 - When the ODS GRAPHICS command was used, the ODS STATISTICAL GRAPHICS Engine with ODS was enabled to “receive” the graphics-related data components from PROC REG and to then
 - Create ODS output objects from them
 - Render them to the given destination (RTF)
 - Each STAT GRAPH-enabled PROC has:
 - A different “suite” of graphics it can present
 - Different graphics that it generates either by default or by specifying options
 - Different syntax conventions to generate graphics.

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What Happened?



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The Statistical Graphics Engine

- New to the Output Delivery System
 - When User Supplied the ODS GRAPHICS ON statement before running a Stat Graph-enabled PROC:
 - PROCEDURE generates additional data components which are received by the Statistical Graphics Engine within ODS and bound to table/style templates to form an output graphics object.
 - ODS then “delivers” the graphics object to the user-specified destination(s)

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The PLOTS and UNPACKPANELS Options in PROC REG

- How do we create separate (larger) plots from the contents of the (default) Diagnostics Panel Plot?
- Use the PLOTS(UNPACKPANELS) Option in the PROC REG Statement.

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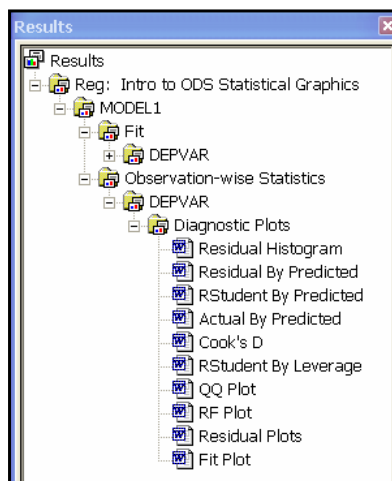
The PLOTS and UNPACKPANELS Options in PROC REG

```
61
62 * unpack panels;
63 ods listing close;
64 * Listing Dest. Does Not Support ODS STAT GRAPHICS;
65 * Enable ODS Graphics;
66 ods graphics;
67 ods rtf file='C:\statgraph2.rtf' bodytitle style=default;
68 title1 'Intro to ODS Statistical Graphics';
69 title2 'Default Stat Graphics';
70 title3 'Diagnostic Panels Plot From ODS Stat Graphics';
71 title4 'The UNPACKPANELS Option';
72 proc reg data=sasclass.regressdata PLOTS(UNPACKPANELS) ;
73 model depvar=y1;
74 quit;
75 * close graphics;
76 ods graphics off;
77 ods listing;
78 * close RTF destination;
79 ods rtf close;
```

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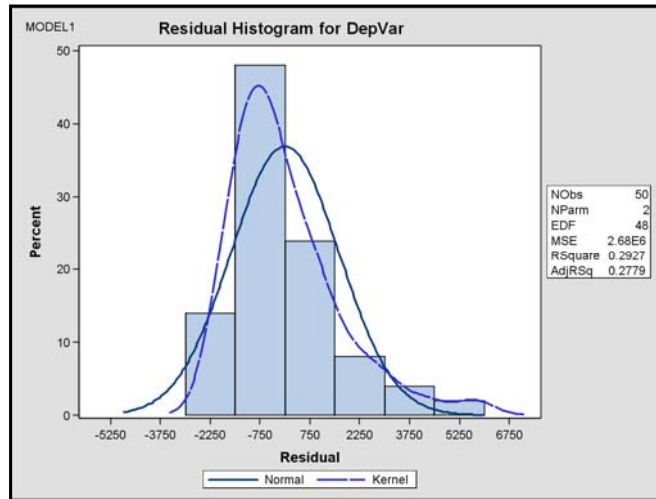
The PLOTS and UNPACKPANELS Options in PROC REG



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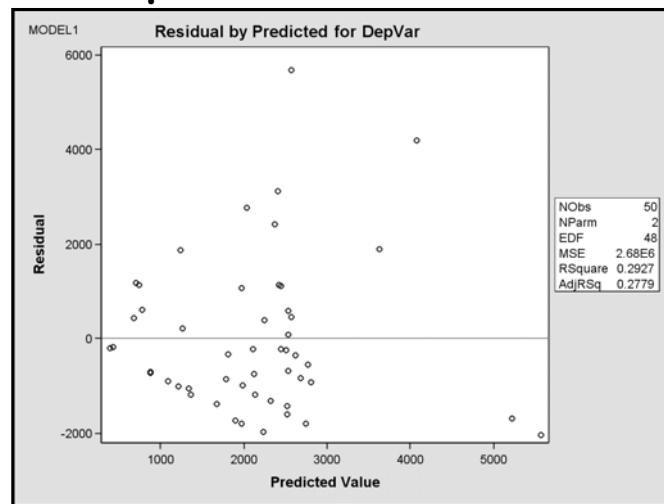
The PLOTS and UNPACKPANELS Options in PROC REG



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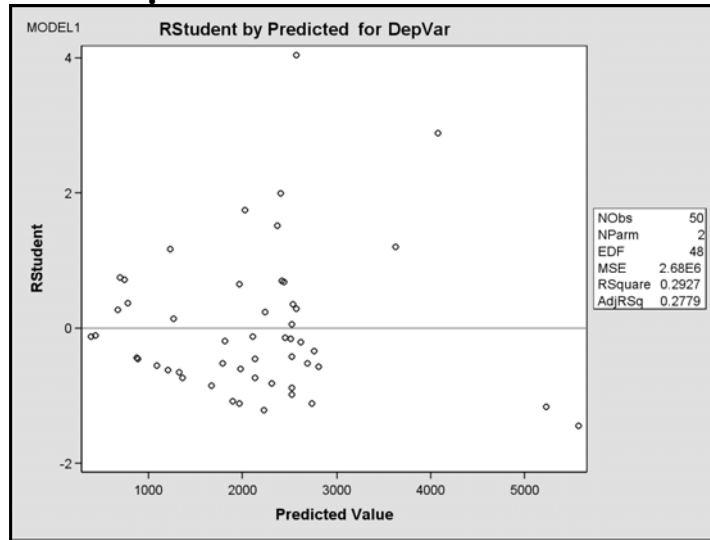
The PLOTS and UNPACKPANELS Options in PROC REG



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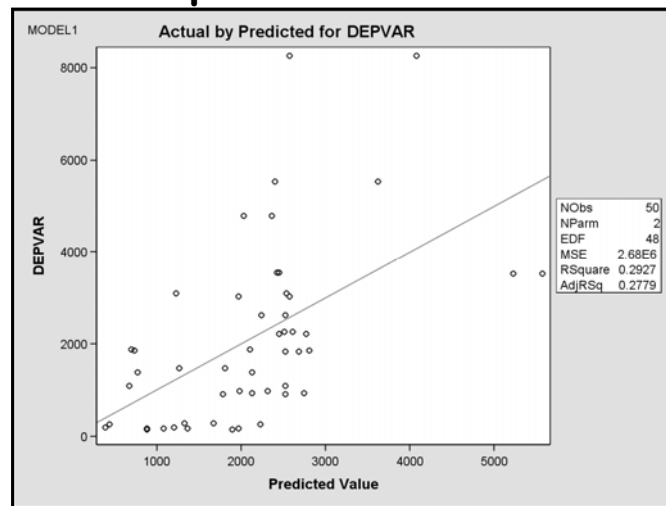
The PLOTS and UNPACKPANELS Options in PROC REG



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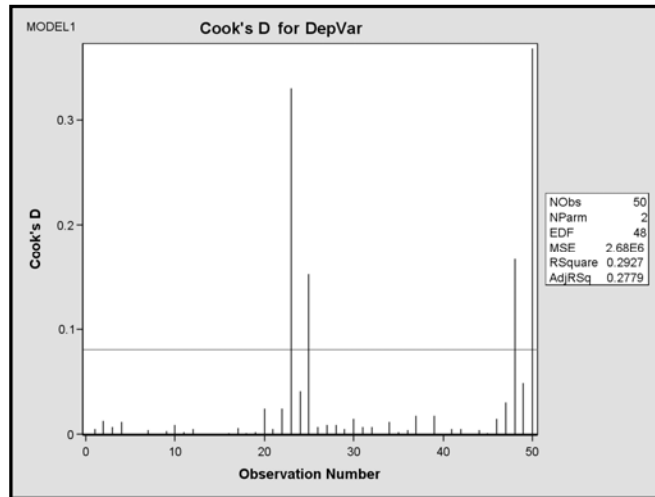
The PLOTS and UNPACKPANELS Options in PROC REG



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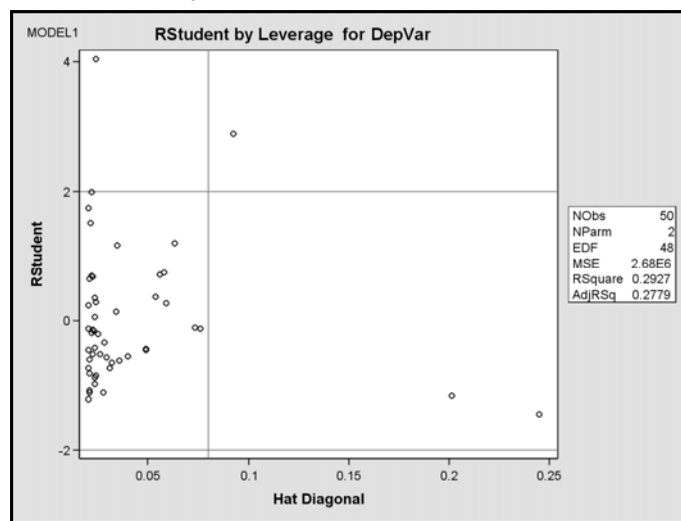
The PLOTS and UNPACKPANELS Options in PROC REG



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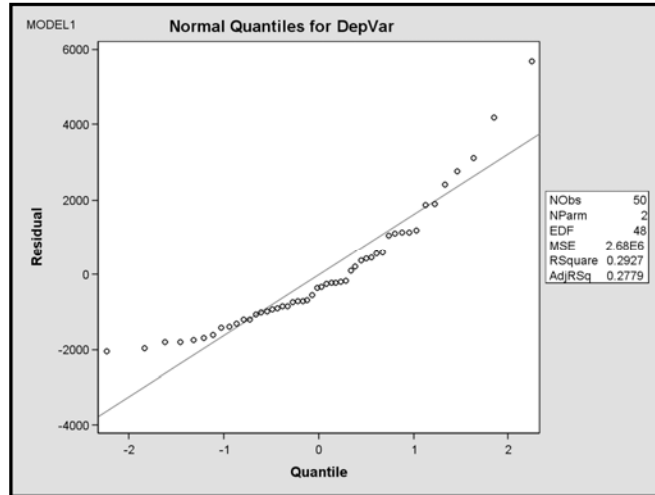
The PLOTS and UNPACKPANELS Options in PROC REG



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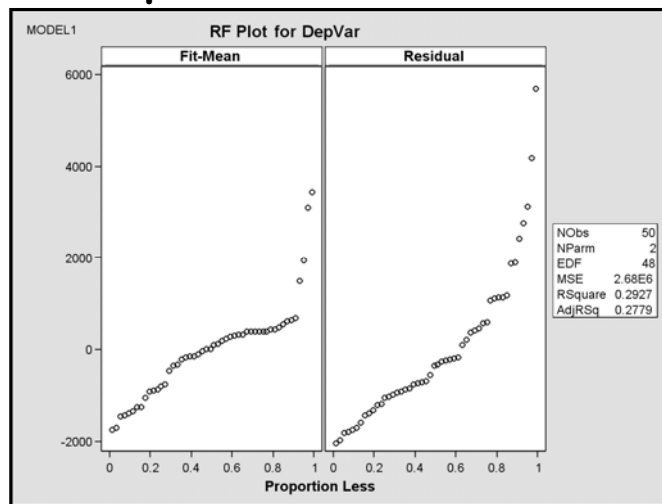
The PLOTS and UNPACKPANELS Options in PROC REG



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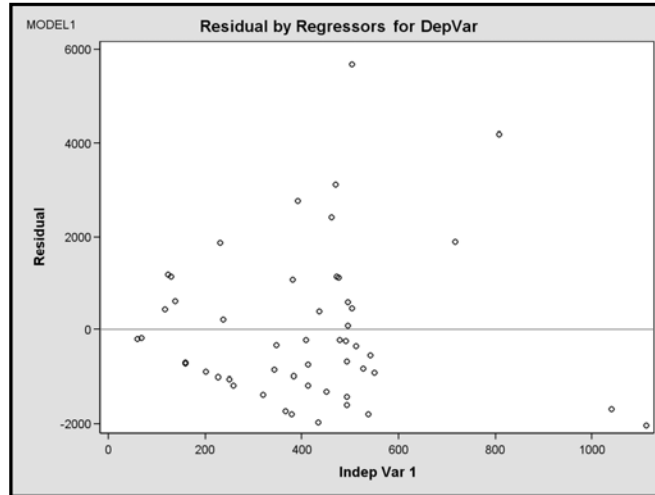
The PLOTS and UNPACKPANELS Options in PROC REG



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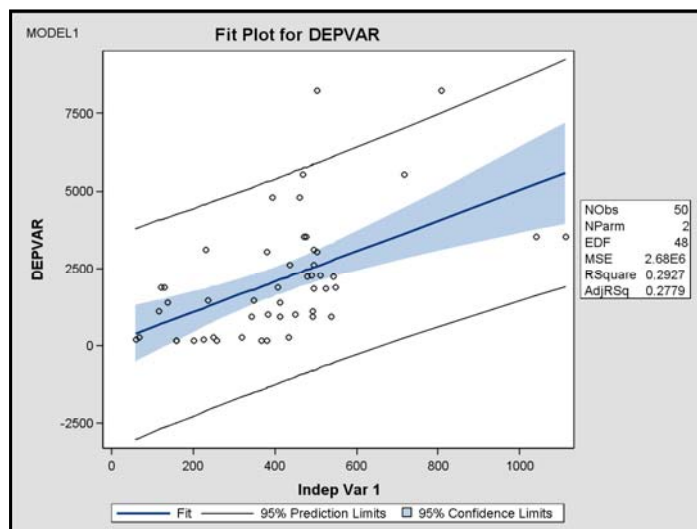
The PLOTS and UNPACKPANELS Options in PROC REG



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The PLOTS and UNPACKPANELS Options in PROC REG



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What Have We Learned So Far?

- ODS Stat Graphics is an Extension of ODS
 - Independent of SAS/GRAPH™ Software
 - 30 PROCs in SAS 9.1 are “STAT GRAPH Enabled”
 - Each of these PROCs can generate graphics data components, which they then give to ODS.
 - ODS renders the output objects to one of the ODS Stat Graphics enabled Destinations
 - ODS GRAPHICS ON/ODS GRAPHICS OFF Statements
 - MUST be invoked BEFORE the destination is declared

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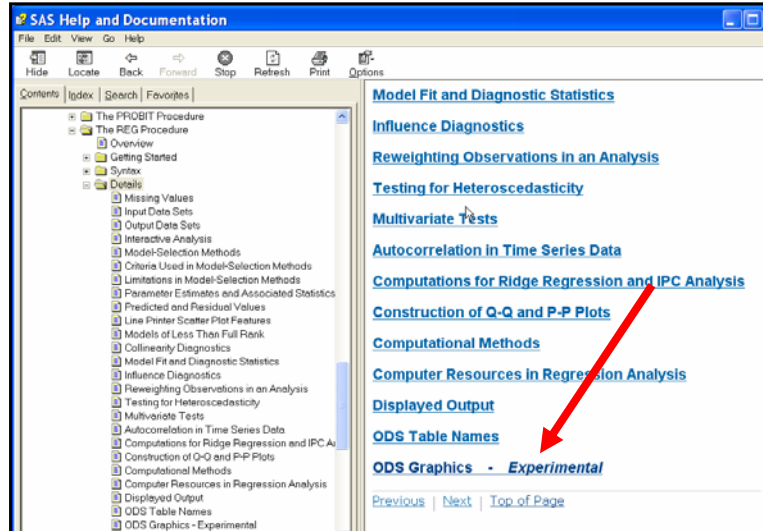
Which Graphs Can Which ODS Stat Graph Enabled PROCs Generate?

- Some general considerations
 - The graphics each PROC can generate depend on the analyses that PROC is intended to do
 - The graphs therefore vary across Stat Graph Enabled PROCs
- How Can We Learn the Names of the Graphs Our Favorite SAS Procedures Can Generate?
 - Documentation
 - ODS TRACE ON/ODS TRACE OFF commands

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Learning the Names of STAT Graphics



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Learning the Names of Stat Graphics

Table 61.9: ODS Graphics Produced by PROC REG

ODS Graph Name	Plot Description	PLOTS Option
ActualByPredicted	Dependent variable versus predicted values	UNPACKPANELS
CooksD	Cook's D statistic versus observation number	UNPACKPANELS
DiagnosticsPanel	Panel of fit diagnostics	
Fit	Regression line, confidence band, and prediction limits overlaid on scatterplot of data	
PartialPlotPanel <i>i</i>	Panel <i>i</i> of partial regression plots	
QQPlot	Normal quantile plot residuals	UNPACKPANELS
ResidualByPredicted	Residuals versus predicted values	UNPACKPANELS
ResidualHistogram	Histogram of fit residuals	UNPACKPANELS
ResidualPanel <i>i</i>	Panel <i>i</i> of residuals versus regressors	
RFPlot	Side-by-side plots of quantiles of centered fit and residuals	UNPACKPANELS
RidgePanel <i>i</i>	Panel <i>i</i> of ridge traces	
RStudentByLeverage	Studentized residuals versus leverage	UNPACKPANELS
RStudentByPredicted	Studentized residuals versus predicted values	UNPACKPANELS

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Learning the Names of Stat Graphics Objects

```

81 ods trace on/listing;
82 ods listing close;
83 * Listing Dest. Does Not Support ODS STAT GRAPHICS;
84 * Enable ODS Graphics;
85 ods graphics;
86 ods rtf file='C:\statgraph2.rtf' bodytitle style=default;
87 title1 'Intro to ODS Statistical Graphics';
88 title2 'Default Stat Graphics';
89 title3 'Diagnostic Panels Plot from ODS Stat Graphics';
90 title4 'The UNPACKPANELS Option';
91 proc reg data=sasclass.regressdata PLOTS(UNPACKPANELS) ;
92 model depvar=y1;
93 quit;
94 * close graphics;
95 ods graphics off;
96 ods listing;
97 * close RTF destination;
98 ods rtf close;
99 ods trace off;

```

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Learning the Names of Stat Graphics

```

Output Added:
-----
Name:      ResidualHistogram
Label:     Residual Histogram
Template:  Stat.REG.Graphics.ResidualHistogram
Path:      Reg.MODEL1.ObswiseStats.DEPVAR.DiagnosticPlots.ResidualHistogram

Output Added:
-----
Name:      ResidualByPredicted
Label:     Residual By Predicted
Template:  Stat.REG.Graphics.ResidualByPredicted
Path:      Reg.MODEL1.ObswiseStats.DEPVAR.DiagnosticPlots.ResidualByPredicted

Output Added:
-----
Name:      RStudentByPredicted
Label:     RStudent By Predicted
Template:  Stat.REG.Graphics.RStudentByPredicted
Path:      Reg.MODEL1.ObswiseStats.DEPVAR.DiagnosticPlots.RStudentByPredicted

Output Added:
-----
Name:      ActualByPredicted
Label:     Actual By Predicted
Template:  Stat.REG.Graphics.ActualByPredicted
Path:      Reg.MODEL1.ObswiseStats.DEPVAR.DiagnosticPlots.ActualByPredicted

```

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Selecting Just the Graph(s) You Want

- Since the output objects generated by ODS Stat Graphics are, in effect, a special “class” of ODS objects, it should not be surprising that the ODS SELECT or EXCLUDE Statement can be used to choose which Objects (including Graphics) you want generated and delivered to an ODS Destination.

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Selecting Just the Graph(s) You Want

```
103 ods graphics;
104 ods rtf file='C:\statgraph3.rtf' bodytitle style=statistical;
105 ods select parameterestimates fit;
106 title2 'Selecting Specific Tables';
107 title3 'Choose Just the Parameterestimates and Fit Tables';
108 proc reg data=sasclass.regressdata ;
109 model depvar=y1;
110 quit;
111 * close graphics;
112 ods graphics off;
113 ods listing;
114 * close RTF destination;
115 ods rtf close;
116
```

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Selecting Just the Graph(s) You Want

The SAS System
Selecting Specific Tables
Choose Just the Parameter Estimates and Fit Tables

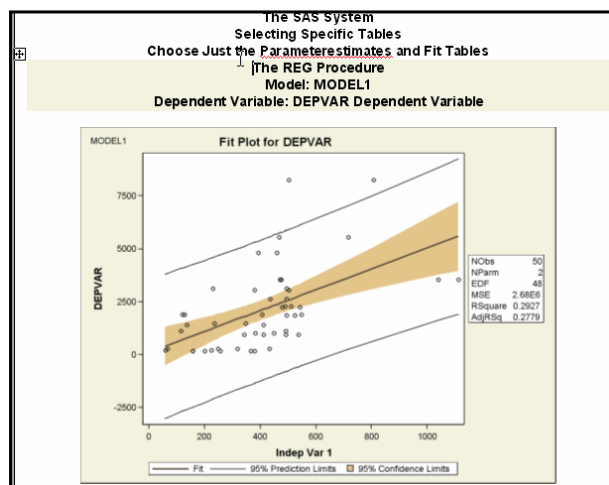
The REG Procedure
Model: MODEL1
Dependent Variable: DEPVAR Dependent Variable

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	96.71848	507.47788	0.19	0.8497
Y1	Indep Var 1	1	4.92220	1.10446	4.46	<.0001

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Selecting Just the Graph(s) You Want



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Specifying a Style Template

- There are about 40 SAS-Supplied Style Templates in SAS 9.
- Three have been designed especially for use with ODS Stat Graphics
 - Analysis
 - Statistical
 - Journal
- The previous example used the Statistical Style.
 - Here is what the Fit Graphics Object looks like when the Analysis and Journal Styles are used.

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Selecting a Style: Analysis

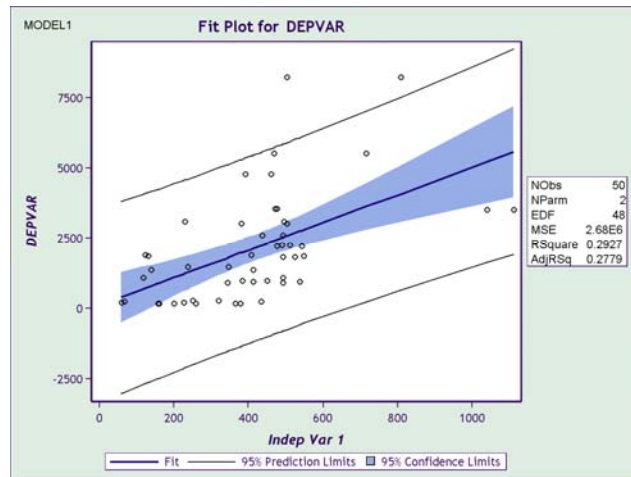
```
117 ods graphics;
118 ods rtf file='C:\statgraph4.rtf' bodytitle style=analysis;
119 ods select fit;
120 title2 'Applying a Style Template';
121 title3 'The Analysis Style';
122 proc reg data=sasclass.regressdata ;
123 model depvar=y1;
124 quit;
125 * close graphics;
126 ods graphics off;
127 ods listing;
128 * close RTF destination;
129 ods rtf close;
```



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Selecting a Style: Analysis



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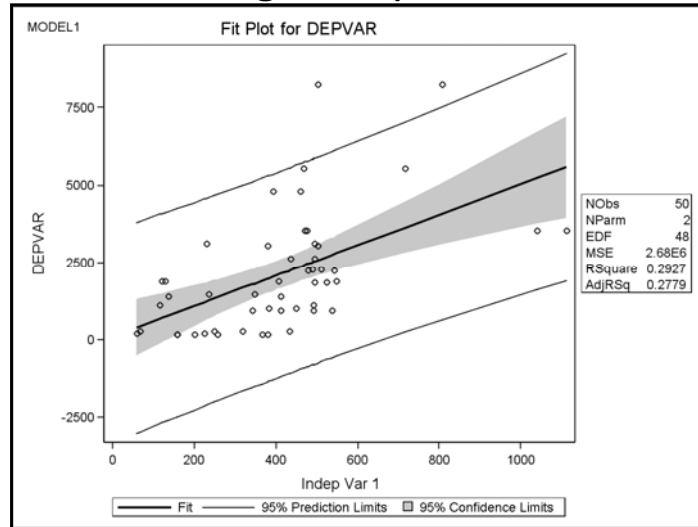
Selecting a Style: Journal

```
131 ods graphics;  
132 ods rtf file='C:\statgraph5.rtf' bodytitle style=journal;  
133 ods select fit;  
134 title2 'Applying a Style Template';  
135 title3 'The Journal Style';  
136 proc reg data=sasclass.regressdata ;  
137 model depvar=y1;  
138 quit;  
139 * close graphics;  
140 ods graphics off;  
141 ods listing;  
142 * close RTF destination;  
143 ods rtf close;
```

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Selecting a Style: Journal



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Using the HTML Destination

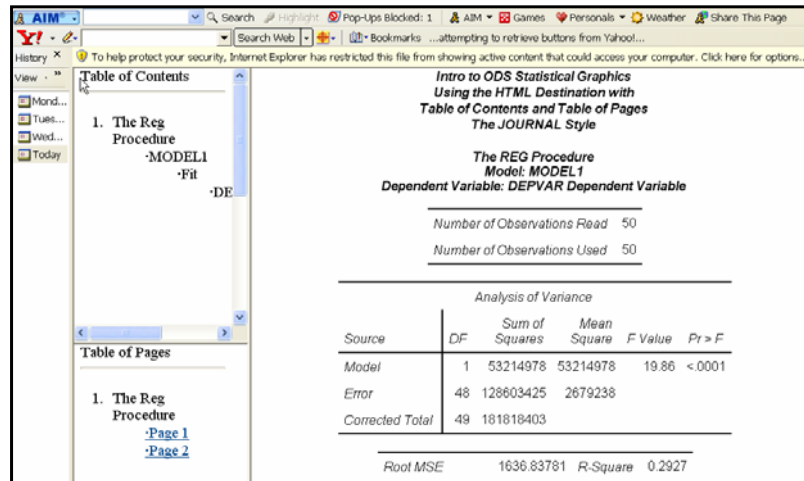
```

146 * using the HTML Destination;
147 ods listing close;
148 ods graphics;
149 ods html path = 'C:\' body = 'sgbody.htm'
150         contents = 'sgcontents.htm' page='sgpage.htm'
151         frame = 'sgframe.htm' style=journal;
152 title2 'Using the HTML Destination with';
153 title3 'Table of Contents and Table of Pages';
154 title4 'The JOURNAL Style';
155 proc reg data=sasclass.regressdata ;
156 model depvar=y1;
157 quit;
158 ods graphics off;
159 ods html close;
160 ods listing;
    
```

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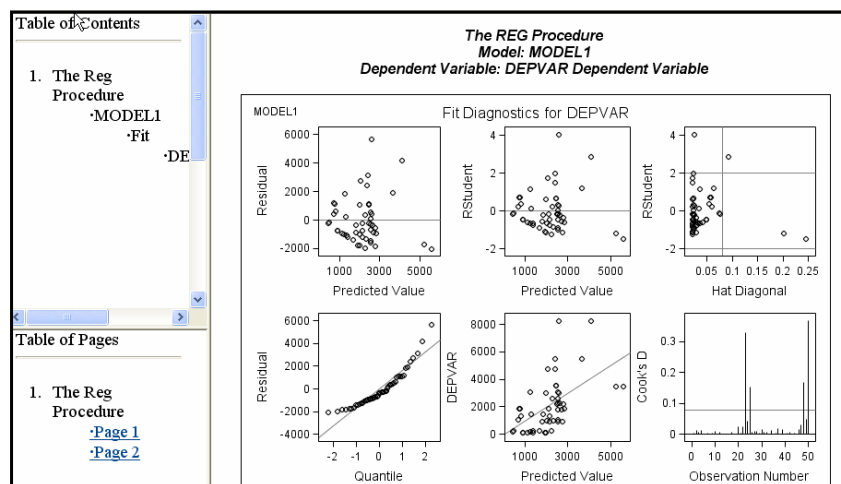
Using the HTML Destination



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Using the HTML Destination



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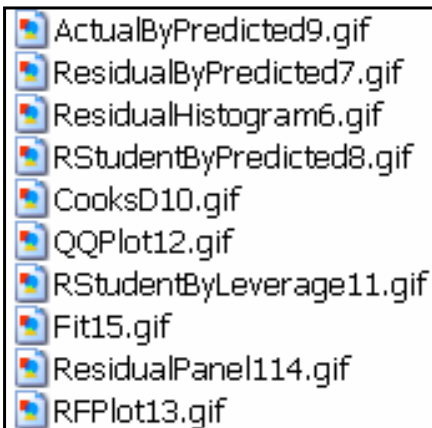
Using the HTML Destination with the UNPACKPANELS Option

```
162 * unpack panels;
163 ods listing close;
164 ods graphics;
165 ods html path = 'C:\' body = 'sgbody2.htm'
166       contents = 'sgcontents2.htm' page='sgpage2.htm'
167       frame = 'sgframe2.htm' style=journal;
168 title2 'Using the HTML Destination with';
169 title3 'Table of Contents and Table of Pages';
170 title4 'The JOURNAL Style';
171 proc reg data=sasclass.regressdata plots(unpackpanels) ;
172 model depvar=y1;
173 quit;
174 ods graphics off;
175 ods html close;
176 ods listing;
```

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Using the HTML Destination with the UNPACKPANELS Option



- ActualByPredicted9.gif
- ResidualByPredicted7.gif
- ResidualHistogram6.gif
- RStudentByPredicted8.gif
- CooksD10.gif
- QQPlot12.gif
- RStudentByLeverage11.gif
- Fit15.gif
- ResidualPanel114.gif
- RFPlot13.gif

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A Bit More About the HTML Destination and ODS Stat Graphics

- By Default, when ODS Stat Graph Objects are delivered to the HTML Destination, they are rendered as GIF (Graphics Interchange Format) files.
 - Optionally, you can render them as JPEG or PNG files.
- The name of each graphics image file has three parts:
 - Base File Name
 - Index Counter
 - Extension

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A Bit More About the HTML Destination and ODS Stat Graphics

- The Index Counter portion is incremented by one unit (digit) every time that image is generated during your SAS Session
 - This is important to know/keep in mind, so that you SELECT or EXCLUDE the exact image you want.
 - For example, if you run PROC REG ten times, which FIT plot do you want to SELECT?
 - A helpful option available in the ODS GRAPHICS Statement:
 - RESET

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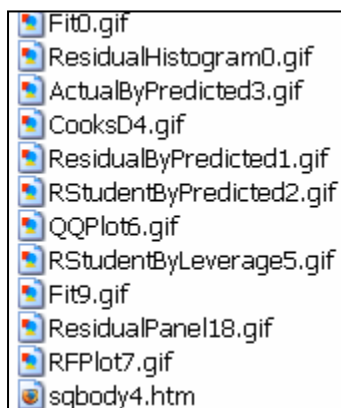
Re-Setting the Image Counter

```
179 * resetting the image counter;
180 ods listing close;
181 ods graphics/reset;
182 ods html path = 'C:\' body = 'sgbody4.htm'
183     contents = 'sgcontents4.htm' page='sgpage4.htm'
184     frame = 'sgframe4.htm' style=journal;
185 title2 'Using the HTML Destination with';
186 title3 'Table of Contents and Table of Pages';
187 title4 'The JOURNAL Style';
188 proc reg data=sasclass.regressdata plots(unpackpanels);
189 model depvar=y1;
190 quit;
191 ods graphics off;
192 ods html close;
193 ods listing;
```

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Resetting the Image Counter



- Fit0.gif
- ResidualHistogram0.gif
- ActualByPredicted3.gif
- CooksD4.gif
- ResidualByPredicted1.gif
- RStudentByPredicted2.gif
- QQPlot6.gif
- RStudentByLeverage5.gif
- Fit9.gif
- ResidualPanel18.gif
- RFPPlot7.gif
- sgbody4.htm

**Using the RESET
Option in the ODS
Graphics Statement**

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Assigning a Name to the Image Files

- Using the IMAGENAME Option in the ODS GRAPHICS Statement
 - Overrides the default assignment of names
 - SAS still increments in the index counter portion of the graphics image as each image is delivered to the HTML Destination

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Assigning a Name to the Image Files

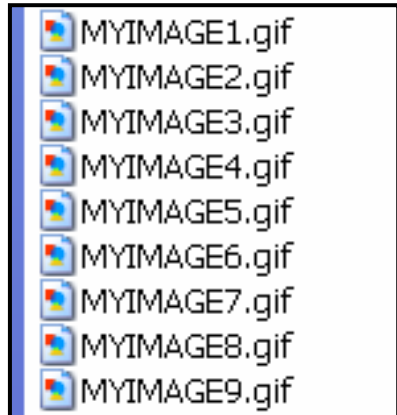


```
195 * using the IMAGENAME option;
196 ods listing close;
197 ods graphics/reset imagename = 'MYIMAGE';
198 ods html path = 'C:\' body = 'sgbody5.htm'
199     contents = 'sgcontents5.htm' page='sgpage5.htm'
200     frame = 'sgframe5.htm' style=journal;
201 title2 'Using the HTML Destination with';
202 title3 'Table of Contents and Table of Pages';
203 title4 'The JOURNAL Style';
204 proc reg data=sasclass.regressdata plots(unpackpanels);
205 model depvar=y1;
206 quit;
207 ods graphics off;
208 ods html close;
209 ods listing;
```

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Assigning a Name to the Image Files



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Creating JPEG Files From ODS Stat Graph Objects Rendered to the HTML Destination

- The IMAGEFMT Option
 - Supplies the desired image format to ODS
 - Values vary by destination
 - For the HTML Destination:
 - GIF (Default)
 - PNG
 - JPEG

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Creating JPEG Files From ODS Stat Graph Objects Rendered to the HTML Destination

MYIMAGE1.gif	9 KB	GIF Image
MYIMAGE2.gif	9 KB	GIF Image
MYIMAGE3.gif	10 KB	GIF Image
MYIMAGE4.gif	8 KB	GIF Image
MYIMAGE5.gif	9 KB	GIF Image
MYIMAGE6.gif	9 KB	GIF Image
MYIMAGE7.gif	10 KB	GIF Image
MYIMAGE8.gif	7 KB	GIF Image
MYIMAGE9.gif	13 KB	GIF Image
MYIMAGE10.jpeg	0 KB	JPEG Image
sgbody6.htm	21 KB	HTM File
sgcontents6.htm	22 KB	HTM File
sgframe6.htm	1 KB	HTM File
sgpage6.htm	20 KB	HTM File
MYIMAGE11.jpeg	28 KB	JPEG Image
MYIMAGE12.jpeg	27 KB	JPEG Image
MYIMAGE13.jpeg	29 KB	JPEG Image
MYIMAGE14.jpeg	27 KB	JPEG Image
MYIMAGE15.jpeg	28 KB	JPEG Image
MYIMAGE16.jpeg	27 KB	JPEG Image
MYIMAGE17.jpeg	30 KB	JPEG Image
MYIMAGE18.jpeg	25 KB	JPEG Image
MYIMAGE19.jpeg	36 KB	JPEG Image

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Modifying the Appearance of a Stat Graph Output Object Using PROC Options

- Most ODS Stat Graph-enabled procedures have options that can control the appearance of their output
 - Recommendation: Read the ODS Statistical Graphics section of the SAS Procedure Documentation carefully!
- Example: Using PROC CORR to generate a scatter plot
 - First, the default when the PLOTS=SCATTER option is specified in the PROC CORR Statement

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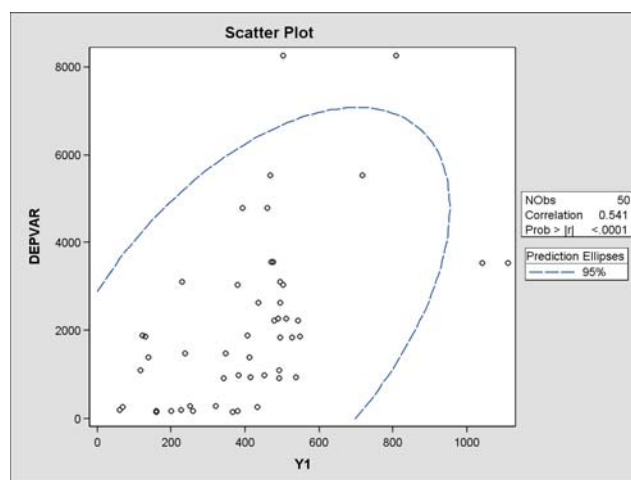
Modifying the Appearance of a Stat Graph Output Object Using PROC Options

```
227 * using another procedure;  
228 * use PROC CORR to generate Scatterplots;  
229 ods graphics;  
230 ods rtf file='c:\scatter1.rtf' style=default;  
231 ods listing close;  
232 proc corr data=sasclass.regressdata PLOTS=SCATTER;  
233 var y1;  
234 with depvar;  
235 title2 'Using ODS Stat Graphics with the CORR Procedure';  
236 title3 'Requesting a SCATTER Plot';  
237 run;  
238 ods graphics off;  
239 ods rtf close;  
240 ods listing;
```

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Modifying the Appearance of a Stat Graph Output Object Using PROC Options



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Modifying the Appearance of a Stat Graph Output Object Using PROC Options

- Suppose we want a 99% confidence interval instead of the default 95% confidence interval?
 - Use the ALPHA Option
- Or, suppose we don't want any confidence interval?
 - Use the ELLIPSE=NONE Option

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Modifying the Appearance of a Stat Graph Output Object Using PROC Options

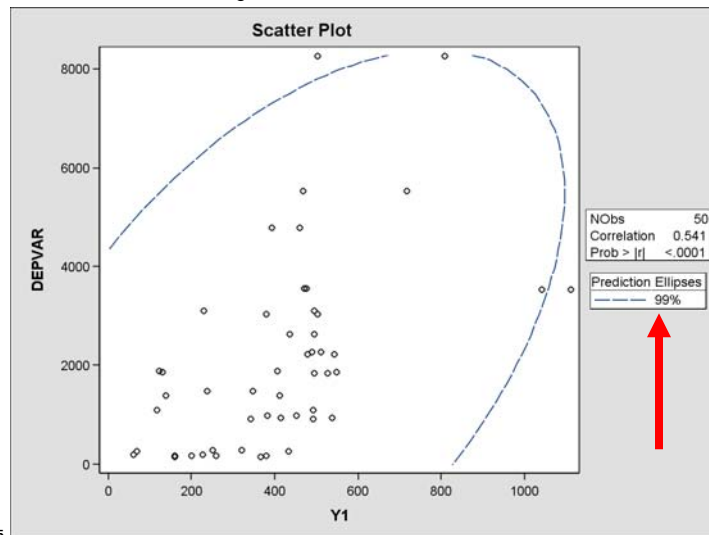
```
255 * using another procedure;
256 * use PROC CORR to generate Scatterplots;
257 ods graphics;
258 ods rtf file='c:\scatter3.rtf' style=default;
259 ods listing close;
260 * generate a 99% confidence interval;
261 proc corr data=sasclass.regressdata PLOTS=SCATTER(ALPHA=.01);
262 var y1;
263 with depvar;
264 run;
265 ods graphics off;
266 ods rtf close;
267 ods listing;
```



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Modifying the Appearance of a Stat Graph Output Object Using PROC Options



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Modifying the Appearance of a Stat Graph Output Object Using PROC Options

```

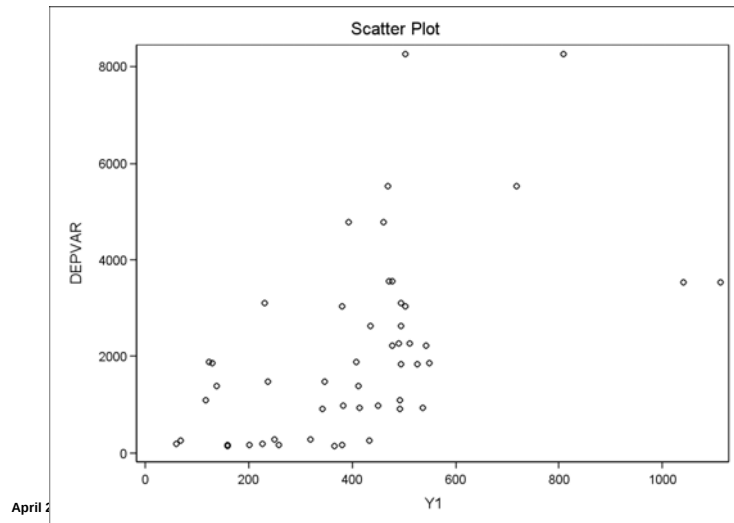
269 * using another procedure;
270 * use PROC CORR to generate Scatterplots;
271 ods graphics;
272 ods rtf file='c:\scatter4.rtf' style=journal;
273 ods listing close;
274 * No prediction ellipse _and_ no info panel;
275 proc corr data=sasclass.regressdata
276     PLOTS=SCATTER(ELLIPSE=NONE NOINSET);
277 var y1;
278 with depvar;
279 run;
280 ods graphics off;
281 ods rtf close;
282 ods listing;
    
```

Two red arrows point to the options `ELLIPSE=NONE` and `NOINSET` in the `PLOTS=SCATTER` statement on line 276.

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Modifying the Appearance of a Stat Graph Output Object Using PROC Options



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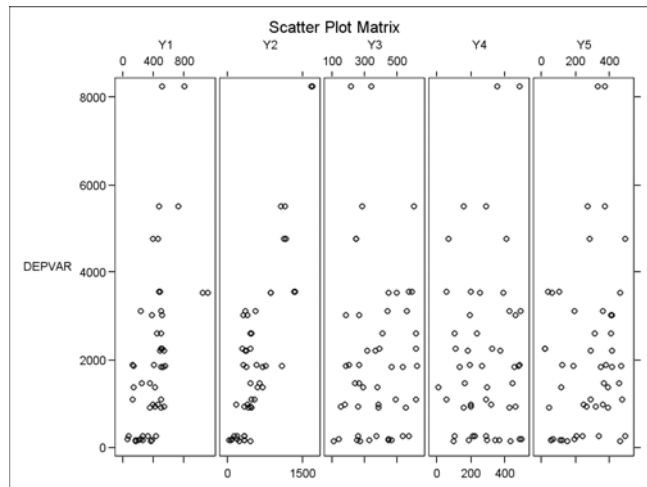
Modifying the Appearance of a Stat Graph Output Object Using PROC Options

```
284 * using another procedure;
285 * use PROC CORR to generate Scatterplots;
286 ods graphics;
287 * generate just the rectangular matrix plot object;
288 ods select recmatrixplot;
289 ods rtf file='c:\scatter5.rtf' style=journal;
290 ods listing close;
291 proc corr data=sasclass.regressdata
292     PLOTS=MATRIX;
293 var depvar
294 with y1-y7;
295 run;
296 ods graphics off;
297 ods rtf close;
298 ods listing;
```

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Modifying the Appearance of a Stat Graph Output Object Using PROC Options



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Modifying the Appearance of a Stat Graph Output Object Using PROC Options

- By default, the maximum number of panels in the MATRIX Plots object is 5.
- We can override that with the NMAXWIDTH=0 option

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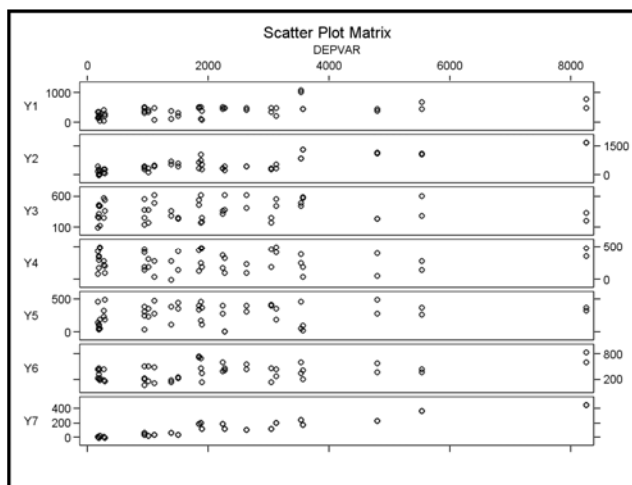
Modifying the Appearance of a Stat Graph Output Object Using PROC Options

```
284 * using another procedure;
285 * use PROC CORR to generate Scatterplots;
286 ods graphics;
287 * generate just the rectangular matrix plot object;
288 ods rtf file='c:\scatter6.rtf' style=journal;
289 ods listing close;
290 proc corr data=sasclass.regressdata
291     /* display all plots */
292     PLOTS=MATRIX(NMAXWIDTH=0);
293 var depvar ;
294 with y1-y7;
295 run;
296 ods graphics off;
297 ods rtf close;
298 ods listing;
```

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Modifying the Appearance of a Stat Graph Output Object Using PROC Options



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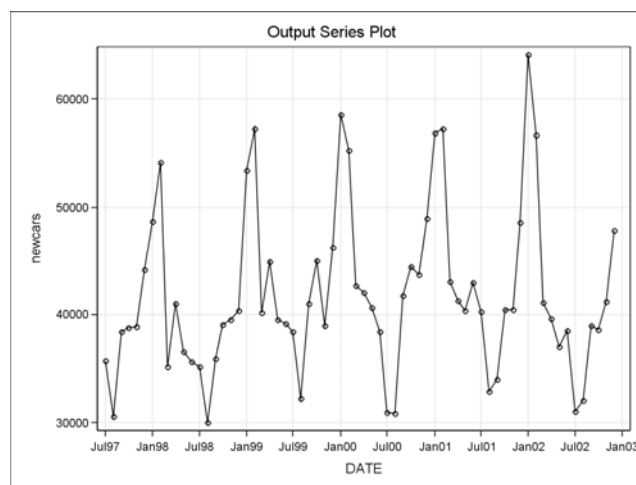
ODS Statistical Graphics and PROC EXPAND

```
ods listing close;
ods graphics; ←
ods rtf file = 'c:\expand1.rtf' bodytitle
  style=journal;
title 'Output Plot from PROC EXPAND';
title2 'Using ODS Statistical Graphics';
title3 'JOURNAL Style';
proc expand data=expand.carmiss ←
  from=month out=carpool plot=output;
convert cars=newcars/observed = total;
id date; run;
ods graphics off; ←
ods rtf close;
ods listing;
```

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ODS Statistical Graphics and PROC EXPAND



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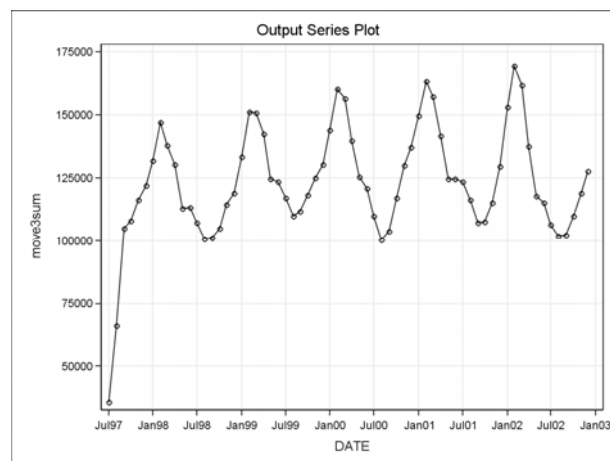
ODS Statistical Graphics and PROC EXPAND

```
ods listing close;
ods graphics;
ods rtf file = 'c:\expand2.rtf' bodytitle
    style=journal;
title 'Output Plot from PROC EXPAND';
title2 'Using ODS Statistical Graphics';
title3 'JOURNAL Style';
proc expand data=expand.carmiss
    from=month out=moveave3
    plot=output;
convert cars=move3sum/observed = total
    transformout=(movsum 3 ceil);
id date; run;
ods graphics off;
ods rtf close;
ods listing;
```

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ODS Statistical Graphics and PROC EXPAND



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ODS Stat Graphics in Other PROCS

- PROC GLM

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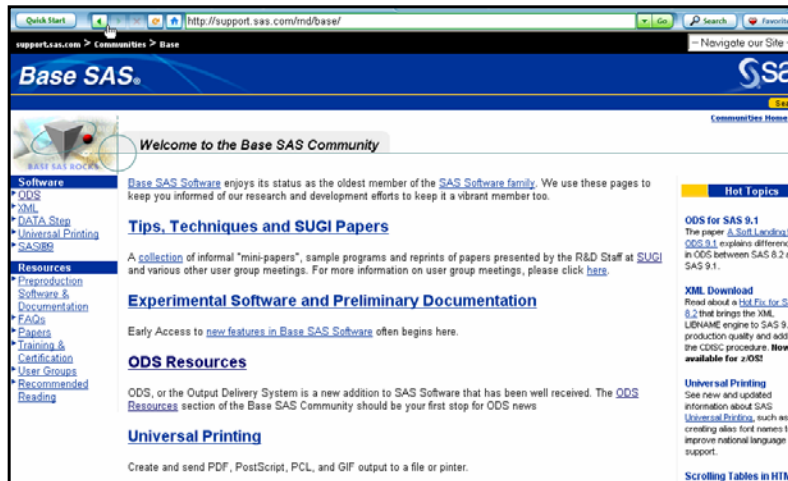
Other Topics

- ODS Stat Graph with other PROCs
- GRAPH Template Language

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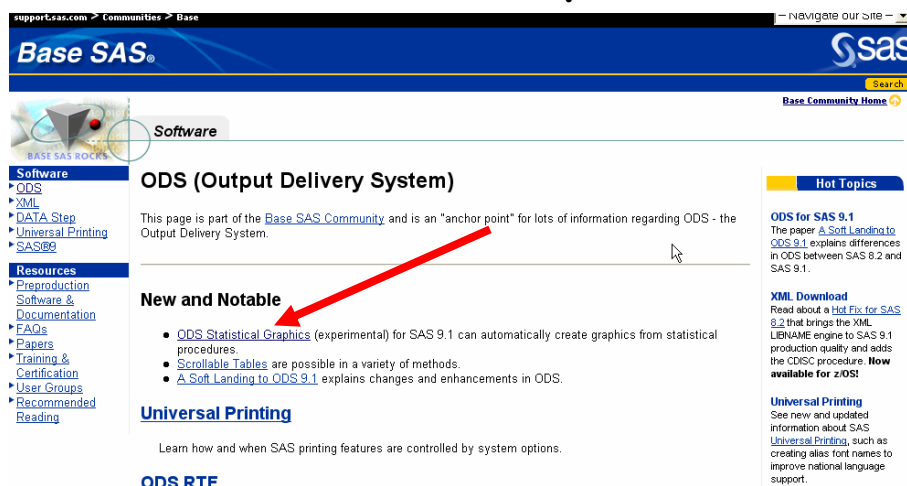
Learning More About ODS Stat Graphics



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Learning More About ODS Stat Graphics



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Learning More About ODS Stat Graphics

ODS Statistical Graphics

On an experimental basis in SAS 9.1, a number of SAS/STAT procedures support an extension to the Output Delivery System (ODS) to create statistical graphics as automatically as tables. This facility is referred to as ODS Statistical Graphics (or ODS Graphics for short).

With ODS Graphics, a procedure creates the graphs that are most commonly needed for a particular analysis. 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.

[Statistical Graphics Using ODS \(Experimental\)](#)

This is the formal documentation, located in the *SAS/STAT User's Guide* in the SAS online documentation.

[TEMPLATE Procedure: Creating ODS Statistical Graphics Output \(Experimental\)](#)

This document provides syntax details about the graph template language of the TEMPLATE procedure.

[ODS Statistical Graphics \(Experimental\) and ODS Styles: Usage and Reference](#)

This document explains how ODS styles interact with ODS statistical graph templates.

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Learning More About ODS Stat Graphics

The screenshot shows the Base SAS website interface. At the top, there is a navigation bar with the text "support.sas.com > Communities > Base" and a "Navigate our Site" dropdown menu. Below this is a blue banner with the "Base SAS" logo and the SAS logo. A search bar is visible on the right side of the banner. The main content area has the title "ODS Statistical Graphics (Experimental) and ODS Styles: Usage and Reference". Below the title, a paragraph states: "This document is for users who wish to learn more about how ODS styles interact with ODS templates of type StatGraph. The contents are organized as follows:". A bulleted list follows, containing the following links: "Overview", "Mappings between Style Elements and Graphical Features", "Examples", "Style Conventions Used in Supplied Graphical Templates", and "Reference".

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Learning More About ODS Stat Graphics

SUGI 29

Statistics and Data Analysis



Paper 204-29 An Introduction to ODS for Statistical Graphics in SAS® 9.1

Robert N. Rodriguez
SAS Institute Inc.
Cary, North Carolina, USA

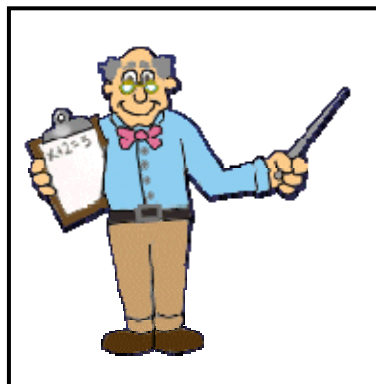
ABSTRACT

In SAS 9.1, over two dozen SAS/STAT® and SAS/ETS® 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 are currently created. This extension, referred to as *ODS for Statistical Graphics* (*ODS Graphics for short*), provides commonly used displays, including scatter plots, histograms, box-and-whisker plots, and contour plots, in ODS output. Many ODS features for tables, such as destination statements, apply equally to graphics. ODS styles control the appearance and consistency of all graphs, whereas ODS templates control the layout and details of individual graphs. This paper introduces statistical users and other SAS programmers to ODS Graphics. Examples illustrate basic functionality, which requires minimal syntax, and typical graph management tasks. Familiarity with ODS for tables is assumed.

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Thanks for Attending!



Questions?

Comments?

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