P a r t 1

Introduction

C h a p t e r 1

Why Use ODS?

If all you want are quick results displayed to the screen or roughly printed out in a stack of output, you can put this book away right now.

However, if you're like the rest of us, you want more from your output. That's because most SAS output is shared with others.

You want your output to be appealing, to help you tell a story. You want your output to be impressive: it should look like you worked on it for hours, even if it took you only a few minutes. In addition, you want your output to be easy to share with other software applications and other users, whether they are across the hall from your office or across the globe.

This chapter shows how you can take some basic SAS output and transform it from a simple line-printer output into a beautiful integrated Web page, a word processor–friendly RTF file, high-resolution printed output, and a bookmarked PDF file.

This chapter does not show any Output Delivery System (ODS) code, but rather just gives you a taste of the types of output you can produce and what each type looks like. The following chapters get into the detail of the code.

Limitations of SAS Listing Output

Before you can appreciate the wonder of ODS, you need to see where we're starting from. The series of simple procedures in the following example describe some sales data. There's a PROC FREQ step, a PROC UNIVARIATE step, and a PROC PRINT step that lists some outliers in the sales data.

```
options formdlim=' ';
title "Frequencies";
proc freq data=sales;
    table ProductName Department;
run;
title "Univariate";
proc univariate data=sales;
    var ItemsSold;
run;
title "Outliers for Price";
proc print data=sales;
    where ItemPrice>13;
    var ItemPrice;
run;
```

The procedures have been run in SAS 9.2, producing Figure.1.1. Because the program processes three different procedures, the resulting output is a series of three reports. The first report has two frequency tables, the second is a report with univariate statistics, and the third report shows line item details for the outliers. (Some of this output has been trimmed in order to fit the results on the page.) Figure 1.1 looks the same way in SAS®9 as it did back in SAS 6, or even SAS 5!

By default, SAS puts each procedure's results on a separate page. To keep this output as short as possible, the program specifies the FORMDLIM= option to remove the page breaks. However, even without the page breaks, the resulting output sprawls across a number of pages. In Figure 1.1, only the frequency tables and the first part of the univariate results fit on the first page.

If a reader of this report has time only to glance quickly at the top page, this output doesn't tell much of a story. You can't see all of the results. For example, what if the outliers for ItemsSold and ItemPrice are the most important message of the report? This information is buried on the second page. The extreme values for ItemsSold and the outlier report for ItemPrice can't be seen.

Also, this report is just plain ugly. Because this is SAS listing output, spaces are used to line up the columns of data and headings. This forces you to use a monospace font, rather than a proportional font. Proportional fonts (like the Times New Roman used for the text you are reading right now) are much easier to read. But if you used a proportional font with SAS listing output, nothing would line up. To see what SAS listing output would look like with a proportional font, look at Figure 1.2 on page 7.

Figure 1.1
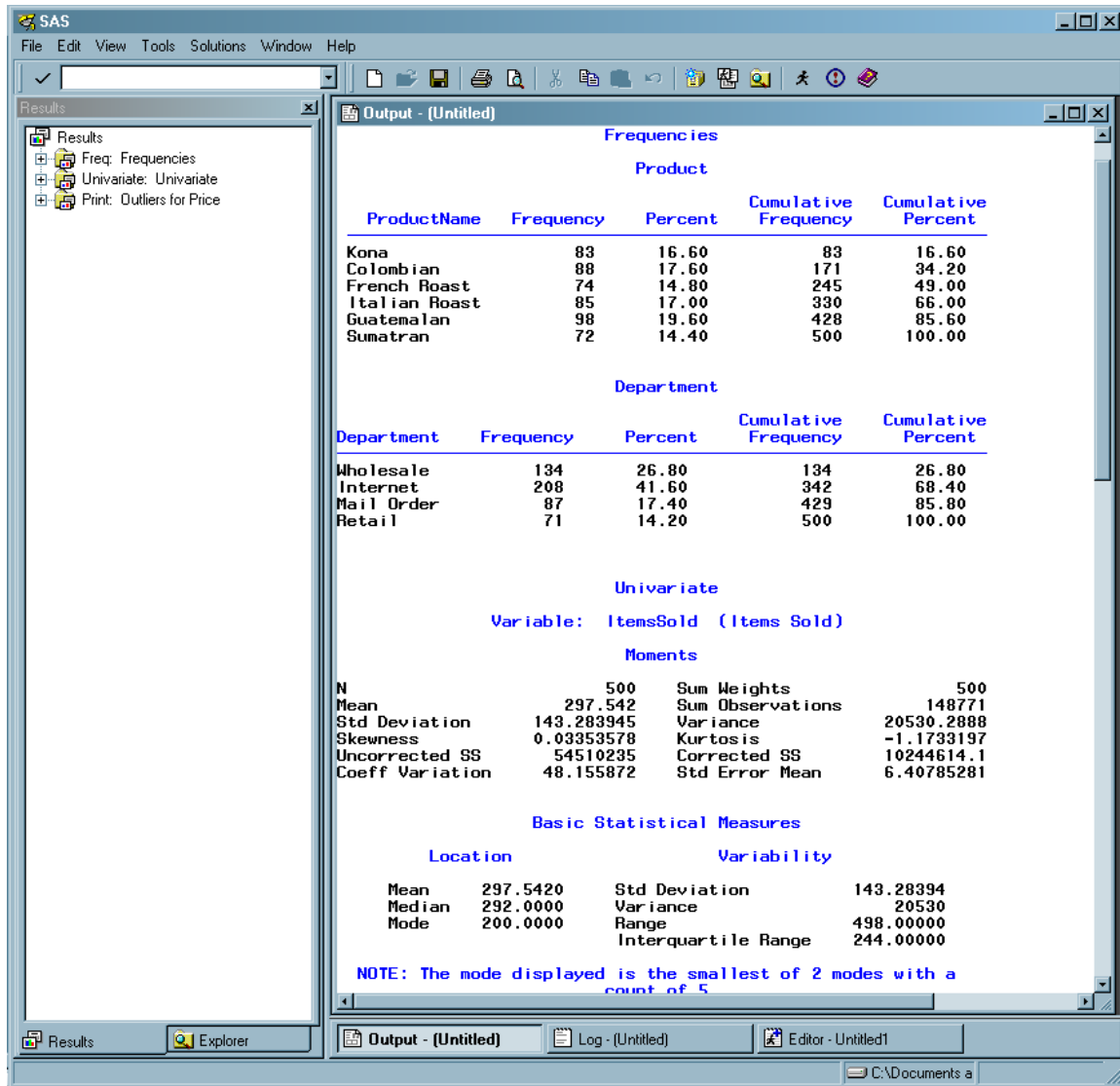
(***Remaining output not shown in order to fit results on this page.***)

Difficulties with Importing Standard Listing Output into a Word Processor

When you're delivering a set of results, frequently you need to combine them with a text-based report that explains what is going on. Ideally, you'd like to combine the results and the text into a single document.

With SAS listing output, it's possible to import your results into a word processor and add explanations and annotations. However, it takes a bit of work to make the results look attractive.

Figure 1.2 shows what the output from the previous example looks like when it is opened in Microsoft Word. Because the default font in Word was set to Arial, a proportional font, these results look terrible. Nothing lines up. In addition, the lines under the table headings have been converted to a bunch of strange characters. This is because these lines were originally rendered in the SAS Monospace font. The codes that generate the smooth lines in table headings work just great if you stick to this font, but as soon as you switch fonts, you get nonsense characters.

To fix this output, the font can be changed to SAS Monospace. Now, if you look at Figure 1.3, you can see that everything lines up properly. However, it's still not very attractive. Monospace fonts are not as easy on the eye as proportional fonts. Table 1.1 illustrates some common proportional and fixed fonts, and shows the difference the proportional spacing can make. Not only are the proportional fonts more appealing, but they also save space. Notice how much longer the lines of fixed-width fonts have to be to display the same text.

Table 1.1 Common Proportional and Fixed Fonts

FONT	SAMPLE TEXT	TYPE
Arial	Sample text to show the appearance of this font.	Proportional
Times New Roman	Sample text to show the appearance of this font.	Proportional
Courier	Sample text to show the appearance of this font.	Fixed
SAS Monospace	Sample text to show the appearance of this font.	Fixed

If you want to use a more readable proportional font yet still keep your columns straight, you need to convert this output into Word tables. Then you can change to any font and everything will still line up.

Word is good at converting text to tables, but SAS listing output presents a challenge. Because the items are separated by spaces, Word creates a new table column wherever spaces occur. This means that if you've got a space within a column (for example, between the words "French" and "Roast" in the row labels of the PROC FREQ), Word will split this column into two columns.

Although you can certainly use a word processor to clean up your SAS listing output, it's a lot of work because it requires so much tweaking to get things to look right. With ODS, there's no need to go through all this. Turn the page to enter the world of ODS.
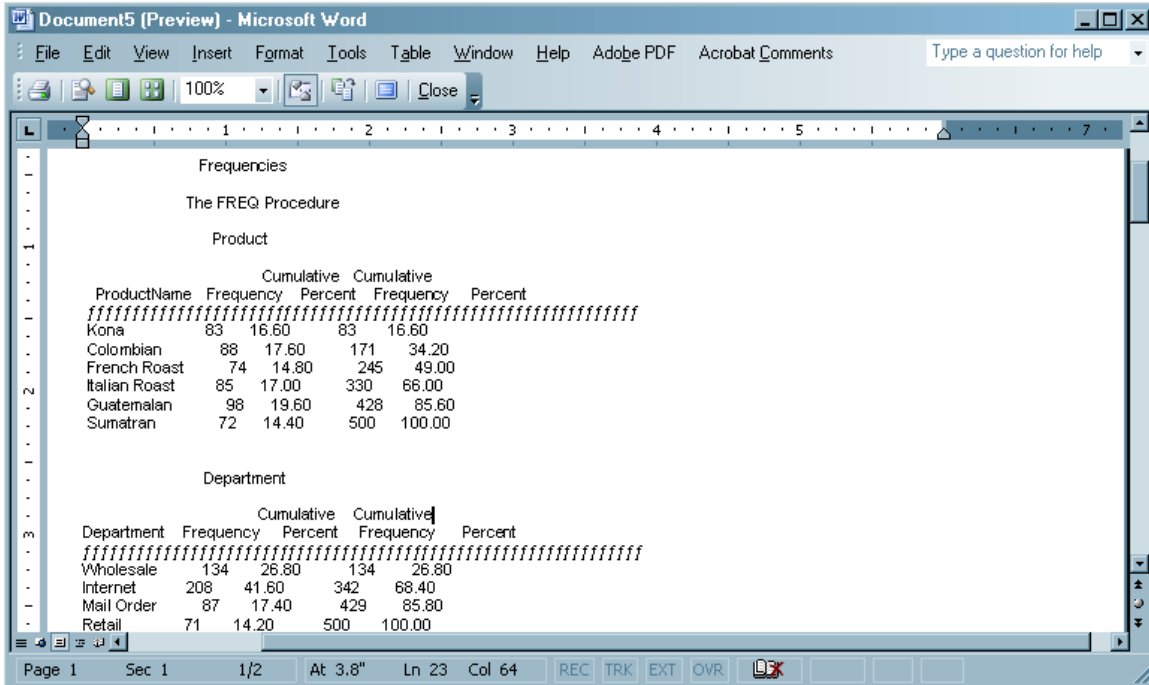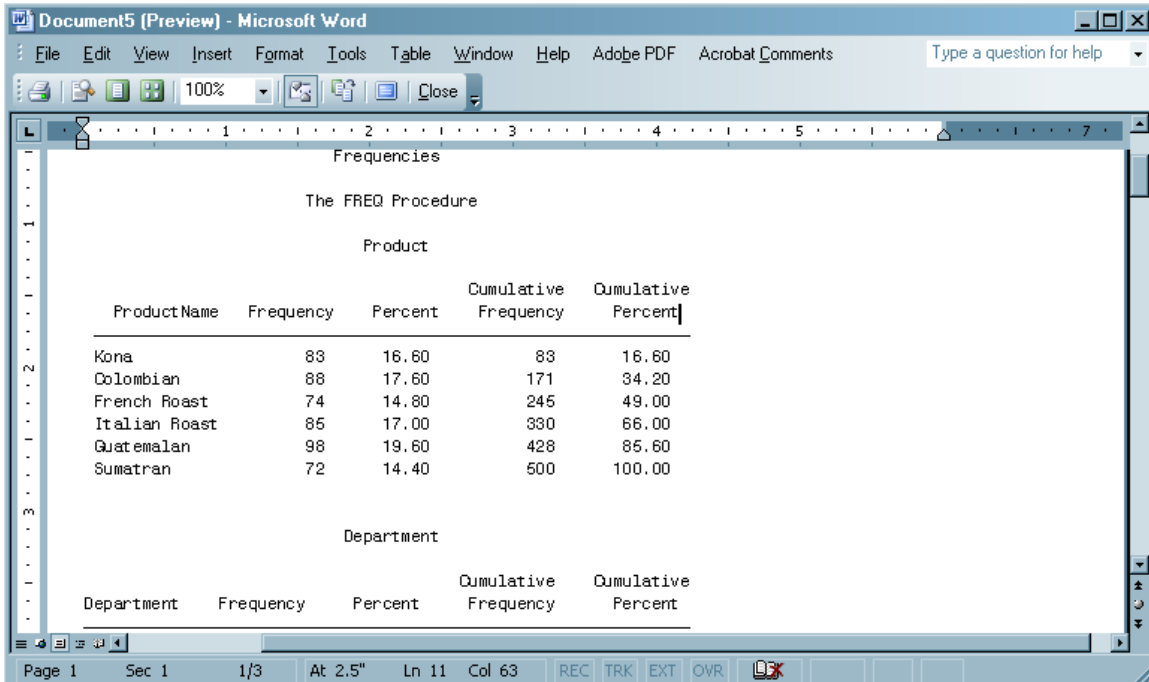
Figure 1.2: SAS Listing Output after Importing into Word

Figure 1.3: Results of Changing to a Non-Proportional Font

ODS Output: A Variety of Formats to Fit Your Needs

The same SAS code as the previous example produces the output in Figure 1.4, but now ODS has directed the output to HTML. You are looking at how the output would appear to someone viewing it with a Web browser. Instead of using the default gray and blue color scheme, this output was produced with the Sasweb style.

Figure 1.4
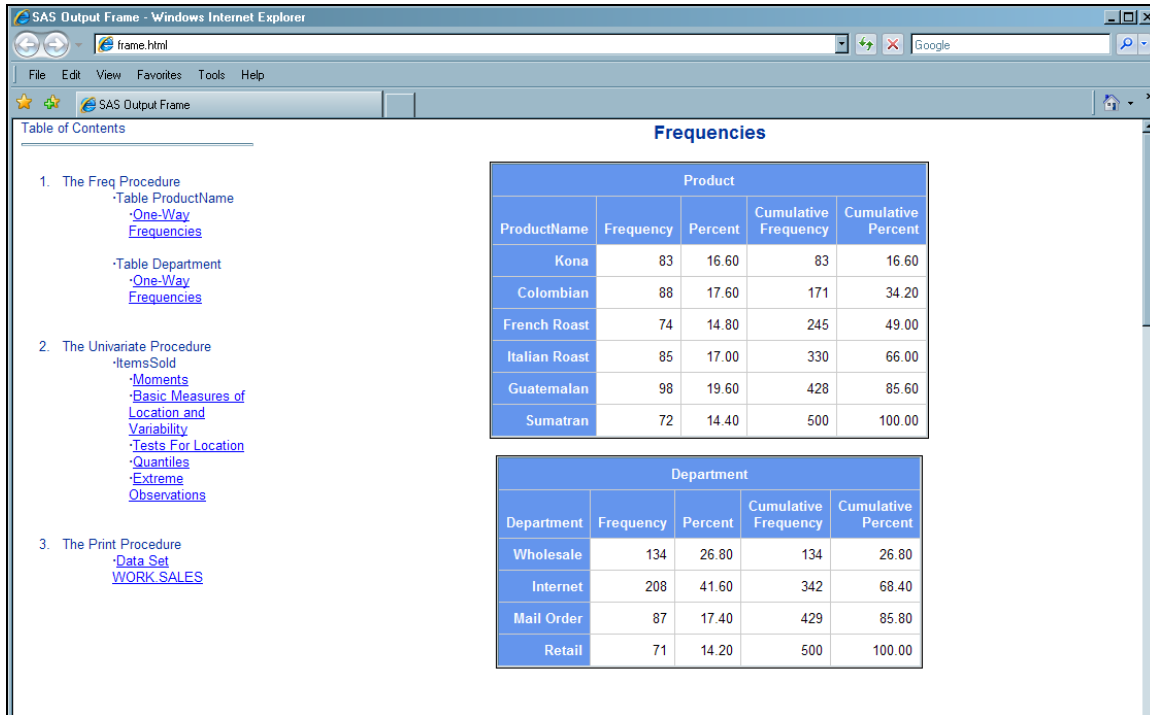
Instead of sprawling from page to page, as with the listing output, this output is neatly packaged with a table of contents to take you directly to whatever you want to view. Instead of using old-fashioned fixed-width fonts, the HTML output uses several good-looking fonts. Instead of being in black and white, the HTML output uses a style of your choice.

All of this adds up to a packaged set of results that you wouldn't be embarrassed to share with your boss. In addition, because this is HTML output, you can place it on your company Web site so your boss can view the report even if he or she is out of the country.

But why stop with HTML output? With ODS you can create the same report in a number of formats sure to please every user. The following example shows the same results, this time directed to RTF and opened in Word. The RTF and PDF versions of the file can even have a table of contents.

Figure 1.5

Product				
ProductName	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Kona	83	16.60	83	16.60
Colombian	88	17.60	171	34.20
French Roast	74	14.80	245	49.00
Italian Roast	85	17.00	330	66.00
Guatemalan	98	19.60	428	85.60
Sumatran	72	14.40	500	100.00

Department				
Department	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Wholesale	134	26.80	134	26.80
Internet	208	41.60	342	68.40
Mail Order	87	17.40	429	85.80
Retail	71	14.20	500	100.00

Note the striking difference between this output and the results we got when we imported SAS listing output into Word in the previous example. The ODS output has been converted into Word tables and is ready to go with no tweaking needed.

If you wanted to change the font used for this output, you could do so without losing the column alignments. Now that your output is in a word processor, it's easy to add explanatory text and annotations. For example, if you wanted to explain something about the mail order figure, you could use a Word callout box to add a note with an arrow pointing to the number it describes.

The RTF output is best if you need to incorporate other information, or if you plan to send your output to others for further editing or annotation. But if all you need is an elegant printed report, you can use ODS to send high-resolution output directly to your printer. The following output shows the same results as they appear when printed using the ODS PRINTER destination.

Figure 1.6

Product				
ProductName	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Kona	83	16.60	83	16.60
Colombian	88	17.60	171	34.20
French Roast	74	14.80	245	49.00
Italian Roast	85	17.00	330	66.00
Guatemalan	98	19.60	428	85.60
Sumatran	72	14.40	500	100.00

Department				
Department	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Wholesale	134	26.80	134	26.80
Internet	208	41.60	342	68.40
Mail Order	87	17.40	429	85.80
Retail	71	14.20	500	100.00

In addition, if you want to create output that you can put on a Web site, and that can be opened with Adobe Reader, you can also use ODS to create PDF files. If your goal is to create the most professional looking results from your output, printer-family output is the way to go. You get crisp table lines and fonts, and you can use color if you have a color printer.

ODS Printer-family output also gives you the option of creating a PostScript or Printer Control Language (PCL) file, in addition to a PDF file, so you can make these printable files available in a variety of formats. If you expect visitors to your Web site will want to print out your results, PDF format is the best approach. HTML output looks great, and loads quickly for people with slower Internet connections, but printing capabilities are limited to browser printing interfaces.

There's one more type of ODS output we haven't seen yet. The previous examples all showed ways of producing reports from your output. But what if you want to do further analysis? In the past, only selected SAS procedures were able to produce output data sets that contained some of their results. ODS, however, enables you to create a data set from most procedures. The data set contains all of the results the procedure is capable of producing in printed output. In addition, ODS produces both the formatted and unformatted values of the variables. In this example, these values are the same, but in other cases, they might not be.

Though you can create data sets from any part of the output, the frequencies and the extreme observations from the univariate analysis were chosen in this example. Figure 1.7 shows the output of a data set created by ODS and PROC FREQ as presented with Viewtable.

Figure 1.7

	Table	ProductName	Product	Frequency	Percent	Cumulative Frequency	Cumulative Percent	Department	Department
1	Table ProductName	Kona	Kona	83	16.60	83	16.60		.
2	Table ProductName	Colombian	Colombian	88	17.60	171	34.20		.
3	Table ProductName	French Roast	French Roast	74	14.80	245	49.00		.
4	Table ProductName	Italian Roast	Italian Roast	85	17.00	330	66.00		.
5	Table ProductName	Guatemalan	Guatemalan	98	19.60	428	85.60		.
6	Table ProductName	Sumatran	Sumatran	72	14.40	500	100.00		.
7	Table Department		.	134	26.80	134	26.80	Wholesale	Wholesale
8	Table Department		.	208	41.60	342	68.40	Internet	Internet
9	Table Department		.	87	17.40	429	85.80	Mail Order	Mail Order
10	Table Department		.	71	14.20	500	100.00	Retail	Retail

Figure 1.8 shows the output of a data set created by ODS and PROC UNIVARIATE as presented with Viewtable.

Figure 1.8

	VarName	Lowest Value	Observation Number of Lowest Value	Highest Value	Observation Number of Highest Value
1	ItemsSold	51	48	547	154
2	ItemsSold	52	264	547	392
3	ItemsSold	52	143	548	142
4	ItemsSold	52	58	549	66
5	ItemsSold	54	440	549	127

If you compare the data set from the frequency distributions to the output shown on the previous page, you can see that the output data set contains every number that was in the table. With these data sets, you can now run further analyses using SAS procedures or the DATA step, or you can create summarized reports with selected results.