

Improving Listing Generation with ODS EXCEL

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ABSTRACT

The ODS destination for EXCEL® simplifies data listing generation while enabling attractive features like sheet protection and AutoFilter to simplify team reviews in a format which is familiar and accessible to non-statistical reviewers. With SAS® 9.4M4, now you can create native Excel files without any post-processing steps, display full titles and footnotes including multiple justifications, and print page numbers and titles on every page, all while reducing the amount of programming required to fit the table to the contents. This paper describes how to utilize the features of the ODS destination for EXCEL to create submission-ready data listings and will provide you with simple workarounds for common compatibility issues.

INTRODUCTION

Data line listings collate source and derived data elements relevant to the analysis for review. They are an important tool for cross-functional data review, quality control, and examination. Often, line listings are presented in RTF and/or PDF formats for inclusion in a report appendix. ODS Tagsets.ExcelXP allows you to generate listings in an Excel readable format, but requires post-processing or use of VBA macros to convert the output file into a native Excel file.

Line data are often requested in Excel format to facilitate cross-functional and regulatory reviews. With ODS Excel, you are one PROC away from making data listings in Excel enabled with features which make the files suitable for cross-functional review. With the advent of the eCOPY program and more companies moving away from paper based document reviews, listings produced with ODS Excel have the potential to obviate the need to produce listings in print ready RTF or PDF files.

ODS EXCEL SYNTAX

ODS Excel was first introduced as an experimental destination in SAS 9.4M2 with a production version available since SAS 9.4M3 and new features added in each subsequent release.

The following code generates a listing of sashelp.cars:

```
proc sort data=sashelp.cars out=cars;
  by origin;
run;

options nodate nonumber missing=' ' nobyline orientation=landscape;

ods excel file="Cars.xlsx" style=excel
options( sheet_interval = 'bygroup'
  sheet_name = '#byval(origin)'
  autofilter = 'all'
  row_repeat = 'header'
  frozen_headers = 'on'
  print_header = '&P'
  embedded_titles = 'yes'
  embedded_footnotes = 'yes'
  ORIENTATION = 'landscape'
  flow = 'tables'
);
```

```

title1 j=1 'Listing of sashelp.cars';
footnotel j=1 "File Generated &sysdate/&systemtime by user &sysuserid..";

proc report data=cars;
  by origin;
  columns Make Model Type DriveTrain MSRP Invoice EngineSize Cylinders
         Horsepower MPG_City MPG_Highway Weight Wheelbase Length;
run;

ods excel close;

```

As shown in Figure 1, the SHEET_INTERVAL='bygroup' option creates a separate worksheet for each country of origin. The sheets are automatically labelled with the value of the by-variable ORIGIN with the option SHEET_INTERVAL='bygroup'. Additional options such as AUTOFILTER, ROW_REPEAT, FROZEN_HEADERS, EMBEDDED_TITLES, and EMBEDDED_FOOTNOTES make the document user friendly by adding column filters and displaying titles, column headers, and footnotes in the default Normal view within Excel.

Display 1 ODS EXCEL Output

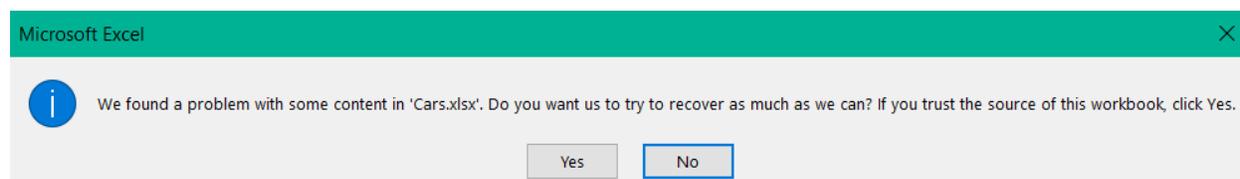
	Make	Model	Type	DriveTrain	MSRP	Invoice	Engine Size (L)	Cylinders	Horsepower	MPG (City)	MPG (Highway)	Weight (LBS)	Wheelbase (IN)	Length (IN)
133	Suzuki	Aerio SX	Wagon	All	\$16,497	\$16,291	2.3	4	155	24	29	2932	98	167
134	Toyota	Prius 4dr (gas/electric)	Hybrid	Front	\$20,510	\$18,926	1.5	4	110	59	51	2890	106	175
135	Toyota	Sequoia SR5	SUV	All	\$35,695	\$31,827	4.7	8	240	14	17	5270	118	204
136	Toyota	4Runner SR5 V6	SUV	Front	\$27,710	\$24,801	4	6	245	18	21	4035	110	189
137	Toyota	Highlander V6	SUV	All	\$27,930	\$24,915	3.3	6	230	18	24	3935	107	185
138	Toyota	Land Cruiser	SUV	All	\$54,765	\$47,986	4.7	8	325	13	17	5390	112	193
139	Toyota	RAV4	SUV	All	\$20,290	\$18,553	2.4	4	161	22	27	3119	98	167
140	Toyota	Corolla CE 4dr	Sedan	Front	\$14,085	\$13,065	1.8	4	130	32	40	2502	102	178
141	Toyota	Corolla S 4dr	Sedan	Front	\$15,030	\$13,650	1.8	4	130	32	40	2524	102	178
142	Toyota	Corolla LE 4dr	Sedan	Front	\$15,295	\$13,889	1.8	4	130	32	40	2524	102	178
143	Toyota	Echo 2dr manual	Sedan	Front	\$10,760	\$10,144	1.5	4	108	35	43	2035	93	163
144	Toyota	Echo 2dr auto	Sedan	Front	\$11,560	\$10,896	1.5	4	108	33	39	2085	93	163
145	Toyota	Echo 4dr	Sedan	Front	\$11,290	\$10,642	1.5	4	108	35	43	2055	93	163
146	Toyota	Camry LE 4dr	Sedan	Front	\$19,560	\$17,558	2.4	4	157	24	33	3086	107	189
147	Toyota	Camry LE V6 4dr	Sedan	Front	\$22,775	\$20,325	3	6	210	21	29	3296	107	189
148	Toyota	Camry Solara SE 2dr	Sedan	Front	\$19,635	\$17,722	2.4	4	157	24	33	3175	107	193
149	Toyota	Camry Solara SE V6 2dr	Sedan	Front	\$21,965	\$19,819	3.3	6	225	20	29	3417	107	193
150	Toyota	Avalon XL 4dr	Sedan	Front	\$26,560	\$23,693	3	6	210	21	29	3417	107	192
151	Toyota	Camry XLE V6 4dr	Sedan	Front	\$25,920	\$23,125	3	6	210	21	29	3362	107	189
152	Toyota	Camry Solara SLE V6 2dr	Sedan	Front	\$26,510	\$23,908	3.3	6	225	20	29	3439	107	193
153	Toyota	Avalon XLS 4dr	Sedan	Front	\$30,920	\$27,271	3	6	210	21	29	3439	107	192
154	Toyota	Sienna CE	Sedan	Front	\$23,495	\$21,198	3.3	6	230	19	27	4120	119	200
155	Toyota	Sienna XLE Limited	Sedan	Front	\$28,800	\$25,690	3.3	6	230	19	27	4165	119	200
156	Toyota	Cellica GT-S 2dr	Sports	Front	\$22,570	\$20,363	1.8	4	180	24	33	2500	102	171
157	Toyota	MR2 Spyder convertible 2dr	Sports	Rear	\$25,130	\$22,787	1.8	4	138	26	32	2195	97	153
158	Toyota	Tacoma	Truck	Rear	\$12,800	\$11,879	2.4	4	142	22	27	2750	103	191
159	Toyota	Tundra Regular Cab V6	Truck	Rear	\$16,495	\$14,978	3.4	6	190	16	18	3925	128	218
160	Toyota	Tundra Access Cab V6 SR5	Truck	All	\$25,935	\$23,520	3.4	6	190	14	17	4435	128	218
161	Toyota	Matrix XR	Wagon	Front	\$16,695	\$15,156	1.8	4	130	29	36	2679	102	171

TROUBLESHOOTING

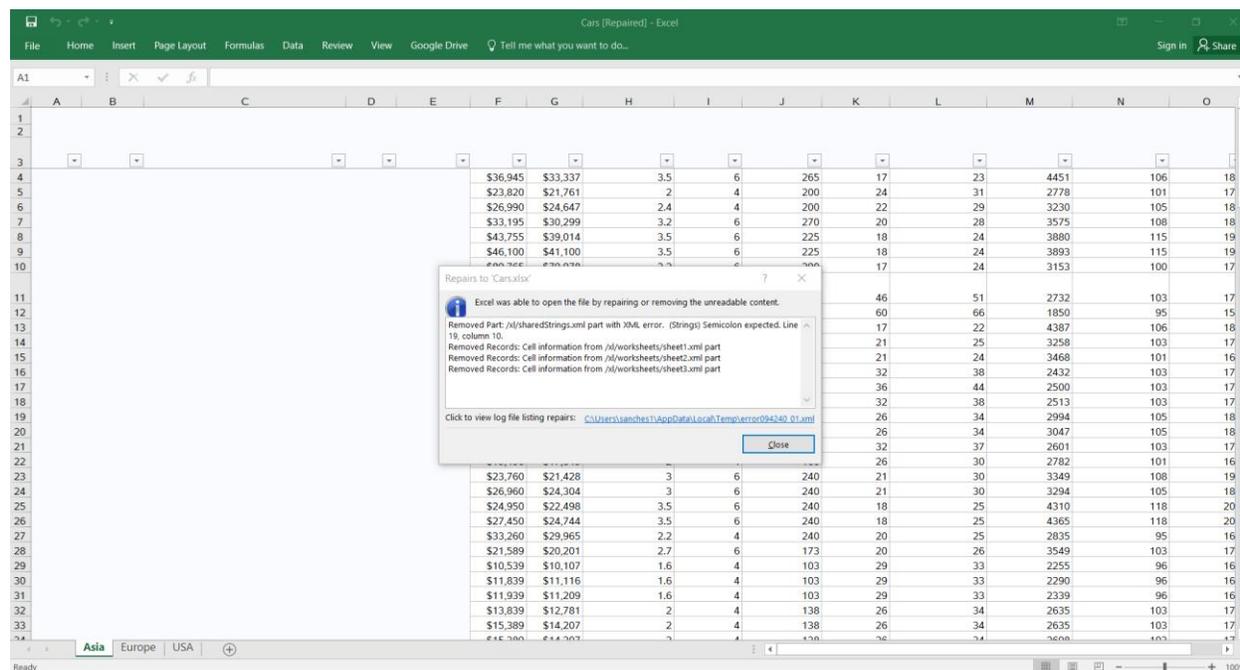
UNREADABLE CONTENT ERRORS

Features frequently used in generating RTF files may cause unreadable content errors, such as shown in Figure 2. Excel will attempt to suppress the problematic content, and portions of your report will be missing or blank as shown in Figure 3.

Display 2 Excel Content Error



Display 3 Recovered File



Check if you have one or more of the following situations:

1. An XML special character (<, >, &,'") was present in any portion of the suppressed file contents
2. In the REPORT procedure, PROTECTSPECIALCHARS=OFF has been specified
3. Multiple title justifications are used in a single title statement in SAS 9.4M3 or earlier and EMBEDDED_TITLES=ON.
4. Multiple justifications are used in a single footnote statement in SAS 9.4M3 or earlier and EMBEDDED_FOOTNOTES=ON.

If it is not needed, remove the PROTECTSPECIALCHARS=OFF option from your proc REPORT statement. This option should be used with caution, as XML special characters in header or footer text (e.g. EMBEDDED_TITLES=NO) may be suppressed or result in unexpected content without generating an error. With PROTECTSPECIALCHARS=ON, the appropriate escape sequence will be passed to Excel to correctly display any XML special characters which appear in the file contents. If you require turning off this option, you will need to mask any special characters that should be displayed as text. The following example uses a DATA step to replace less than characters in a display variable with an equivalent Unicode value:

```
ods escapechar='^';
data cars2;
  set cars;
  maskvar=transtrn(disppvar,'<','^{unicode 003C}');
run;
```

In SAS 9.4M3 or earlier, use of multiple justification within a single title or footnote statement is not supported when titles or footnotes are embedded in the document, and will result in an unreadable content error.

IMPROVEMENTS IN ODS EXCEL

Improvements have been made in ODS EXCEL functionality with each subsequent maintenance release. For example, when using SAS 9.4M3 or earlier, AUTOFILTER did not function as expected in multi-sheet workbooks. However, this issue is solved in SAS 9.4M4. In SAS 9.4M4, you now also have the ability to use multiple title and footnote justifications for embedded titles and footnotes. This works well for most small tables of 3-5 columns when the left, centered, and right justified text strings are relatively short. Rules for merging columns and wrapping title text in order to enable this feature can be optimized in future maintenance releases. Also introduced in SAS 9.4M4, the PROTECT_WORKSHEET option protects the workbook content from changes by setting read-only access. When both AUTOFILTER and PROTECT_WORKSHEET options are used, PROTECT_WORKSHEET takes precedence, and column filters will be applied but disabled. These features may be made compatible in future maintenance releases.

CONCLUSION

The ODS EXCEL destination streamlines production of data listings. Evolution in documentation and submission practices away from paper and into fully electronic format may eliminate the meticulous attention to detail and fine adjustments needed to prepare line listings into print-ready formats. In the future, ODS EXCEL could become the go-to destination for generating line listings to support both cross-functional and regulatory e-reviews.

ACKNOWLEDGMENTS

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RECOMMENDED READING

- SAS Institute Inc. 2016. SAS 9.4 Output Delivery System: User's Guide. Cary, NC: SAS Institute Inc. Available at <http://support.sas.com/documentation/cdl/en/odsug/67921/HTML/default/viewer.htm#titlepage.htm>.
- "A Ringside Seat: The ODS Excel Destination versus the ODS ExcelXP Tagset" Chevell Parker, SAS Institute Inc. Available at <https://support.sas.com/resources/papers/proceedings16/SAS5642-2016.pdf>
- SAS9 ODS Destination for Excel Tip Sheet. Available at https://support.sas.com/rnd/base/ods/ODS_Excel_Dest_tips.pdf

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