

Automate Large Volume Client-Specific Report Production using Nested SAS Macros, Excel VBA, and DDE

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Abstract

Techniques for exporting data from SAS to Excel using Dynamic Data Exchange (DDE) have been around since late 1990's. Executing Visual Basic for Applications (VBA) programs (a.k.a. macros) stored in an Excel workbook file directly from a SAS application had also been reported in recent years. However, little to no literature was available as to how a SAS developer may export large volume of client-specific SAS data to multiple Excel worksheets (one sheet per client). Furthermore, users of Excel 97 - still a popular business application - reportedly will encounter a memory error when some 30 worksheets embedded with tables and graphs are created within a workbook file. Because of which, it is necessary to produce multiple workbooks within each only about 30 formatted worksheets (reports) are stored. This paper will demonstrate a technique for automating the above-described process using nested SAS macros, Excel VBA and DDE. Regardless of the number of clients (volume of reports), multiple Excel worksheets and workbooks will be automatically generated with data exported from SAS. And the SAS macro program will save each workbook with a distinct and easy-to-understand file name in the end.

Background

As the Quality Improvement Organization (QIO) for the State of Missouri overseeing quality of care delivered for Missouri's Medicare beneficiaries, my company often produces provider-specific reports based on abstraction data collected from medical record review. Health care providers' compliance with clinical guidelines is summarized in tables and graphs along with statewide aggregate results. These reports are intended to identify performance deficiencies and stimulate quality improvement activities among hundreds of providers and/or thousands of clinicians. As the federal government selects around 10 clinical topics each focusing on multiple indicators in a pre/post study design, one can imagine the volume of reports to be handled.

Because of this need, we have developed a technique to automate the report production process using SAS 8 and Excel 97 via Dynamic Data Exchange (DDE). Throughout this paper, I will discuss the technical details involved in the process. This paper will also demonstrate the “how to” in each critical step

including report template design, data preparation, Excel VBA subroutine (macro) recording, SAS macro programming, and most importantly, saving each generated workbooks with a meaningful file name.

Getting Started – Template Design and Data Preparation

The lesson learned is – always start from designing the end product. Only after the report template is finalized should data preparation and programming be initiated. Otherwise, any subsequent changes made to the report template will cause partial or complete overhaul of the preceding steps. In this case study, the report to be produced is a provider-specific five-star rating summary by clinical topic and indicator (Figure 1). Other report elements include 1) facility name, 2) Medicare provider number [MPN], 3) indicator numerator, denominator & rate, and 4) statewide statistics (median, minimum, maximum).

Figure 1: the “Star Report”

Missouri Provider Specific Schedule									
Inpatient Services									
	Therapeutic	Diagnostic	AMP	Bed†	Setting*	Bedday	High	Low	
PHYSICIAN CONSULTATION									
Initial office visit within 14 days of onset	15	20	15	15	15	15	15	15	15
Subsequent office visit	6	10	6	6	6	6	6	6	6
Initial office visit within 14 days of onset	5	13	4	4	4	4	4	4	4
Subsequent office visit	1	5	1	1	1	1	1	1	1
Initial office visit within 14 days of onset	1	5	1	1	1	1	1	1	1
Subsequent office visit	1	5	1	1	1	1	1	1	1
Initial office visit within 14 days of onset	1	5	1	1	1	1	1	1	1
Subsequent office visit	1	5	1	1	1	1	1	1	1
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Subsequent office visit	1	5	1	1	1	1	1	1	1
Initial office visit within 14 days of onset	1	5	1	1	1	1	1	1	1
Subsequent									

After report elements are identified, raw abstraction data from chart review are processed and organized into facility-level line records ready to be exported into Excel spreadsheets. Aggregate statistics are also calculated for each topic and indicator. Worth mentioning is provider's compliance rates are first transformed into strings made of 0, 1, and/or 2 based on a five-star classification system. These 0-1-2 strings are later changed into star symbols in the Excel reports where each solid star (★) represents 20% (or between 11% and 20%) and each hollow star (☆) represents 1% to 10%. The attached SAS

program TO_STAR.SAS includes notes and examples for data layout.

Excel VBA Macro Recording

Three Excel macros are recorded in the report template: REPLACE012, RENAMESHEET, and DELBLANK. Their functions and codes are described below.

REPLACE012 is executed by SAS after a new worksheet is created and populated with a provider's statistics especially the five-star rating. All 0-1-2 characters will be replaced with star symbols (in Windings typeface) to depict the provider's performance level. (See TO_STAR.SAS for codes)

RENAMESHEET is executed by SAS after a worksheet is populated with information. This macro renames the newly recreated worksheet with the provider's MPN before the next iteration begins. (See TO_STAR.SAS for codes)

DELBLANK will be executed to delete the blank template sheet when all providers' worksheets are completed before SAS calls Excel to save and close the newly created workbook. (See TO_STAR.SAS for codes)

SAS Codes and Macros

Only the most critical steps are described in detail. The complete SAS program is available as attachment.

```

/*****
Invoke Excel
*****/
X " 'C:\PROGRAM FILES\MICROSOFT
OFFICE\OFFICE\EXCEL.EXE' ";

```

```

/*****
Determine how many "Excel runs" (~30
worksheets/run) needed
*****/
PROC SQL;
SELECT CEIL(COUNT(*)/30) INTO :EXCELRUN
FROM METRC6MO.UNIQMPN;

```

```

/*****
A do-loop macro for creating Excel workbooks
*****/
%MACRO DOBOOK;
%DO I = 1 %TO &EXCELRUN.;

```

```

/*****
Open the excel template and minimize the application
window (tip: turn off Excel macro virus protection so
Excel will not repeatedly bring up "enable/disable
macro" alert)
*****/
FILENAME CMDS DDE 'EXCEL|SYSTEM';
DATA _NULL_;
FILE CMDS;
PUT
' [OPEN("S:\METRICS\6SOWMOBL\REPORT\TE
MPLATE.XLS")];
PUT '[APP.MINIMIZEQ)];

```

```

/*****
Process a sub-set of data containing 30 providers
*****/
DATA SUBSET;
SET METRC6MO.UNIQMPN (KEEP=MPN);
IF (30 * &I - 29) <= _N_ <= (30 * &I) THEN
OUTPUT SUBSET;

```

```

/*****
Obtain macro variables FIRSTMPN & LASTMPN
with values from DATA SUBSET (FIRSTMPN &
LASTMPN will be used in the file name before the
Excel workbook is saved)
*****/
SET SUBSET END=LAST;
IF _N_=1 THEN DO; CALL
SYMPUT('FIRSTMPN', MPN);
%PUT &FIRSTMPN; END;
IF LAST THEN DO; CALL
SYMPUT('LASTMPN', MPN);
%PUT &LASTMPN; END;

```

```

/*****
Create a loop to determine number of iterations
needed for the sub-set (30 in this case)
*****/
PROC SQL;
SELECT COUNT(*) INTO :LOOPTO FROM
SUBSET;

```

```

/*****
Process (30) providers in a do-loop and drop already
completed subset (providers) after each loop
*****/
%MACRO DOSHEET;
%DO J=1 %TO &LOOPTO.;

```

```

/*****
First provider, currently processed
*****/
DATA CURRENT SUBSET;

```

```

SET SUBSET;
IF _N_=1 THEN OUTPUT CURRENT;
ELSE OUTPUT SUBSET;

/*****
Make a copy of the template (worksheet "blank") in
excel file template.xls (the newly created worksheet
will be named "blank(2)" by excel)
*****/
DATA _NULL_;
COPYCMD=[WORKBOOK.COPY("BLANK",
"TEMPLATE.XLS")];
FILE CMDS;
PUT COPYCMD;

/*****
Populate the worksheet with provider-specific and
aggregate information (codes omitted – see attached
SAS program)
*****/

/*****
Run a macro to replace rating classifications 0, 1 & 2
to space, full & hollow stars in excel
*****/
DATA _NULL_;
FILE CMDS;
PUT
%UNQUOTE(%STR(%[RUN("TEMPLATE.XLS!R
EPLACE012")])%');

/*****
All done for the provider currently processed... tell
Excel to rename the current worksheet with provider
number stored in cell [N4]
*****/
DATA _NULL_;
SELCMD=[SELECT("R4C14","R4C14")];
FILE CMDS;
PUT SELCMD;
PUT
%UNQUOTE(%STR(%[RUN("TEMPLATE.XLS!R
ENAMESHEET")])%');

%END;
%MEND DOSHEET;
%DOSHEET;

/*****
Run excel macro to delete the blank sheet (template)
(tip: turn off display alerts so Excel will not
repeatedly ask for sheet deletion confirmation)
*****/
DATA _NULL_;
FILE CMDS;

```

```

PUT [RUN("DELBLANK")];

/*****
Save and close the newly populated excel workbook
*****/
DATA _NULL_;
FILE CMDS;

%LET
FILENAME="S:\METRICS\6SOWMOBL\REPORT
\STAR_&FIRSTMPN._TO_&LASTMPN..XLS";
%LET
SAVEFILE=%STR(%[SAVE.AS(&FILENAME)]%
');
%LET
CLOSFILE=%STR(%[CLOSE(&FILENAME)]%);
PUT %UNQUOTE(&SAVEFILE);
PUT %UNQUOTE(&CLOSFILE);
RUN;

%END;
%MEND DOBOOK;
%DOBOOK;

```

Results

This single SAS program successfully processed reports for 119 providers and generated four Excel workbooks with up to 30 worksheets in each book. Each health care provider now has a distinct “star” report in an Excel worksheet (named after the provider number) ready to be printed. In addition, each workbook is saved with a file name indicating the range of providers included in the book.

Conclusions

This paper demonstrates a set of useful procedures using SAS macros, Excel VBA subroutines and DDE to produce large volume client-specific reports. The techniques described in this paper have the potentials to be applied in other Microsoft Office applications in automating report production process.

Contact Information

Please send comments, questions or suggestions to:

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