Paper HOW-02

Macro Quoting - How and Why

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Abstract

Macro quoting requires precision understanding. Sometimes it is correct to quote and sometimes it is wrong. To quote correctly you must know what needs to be hidden (or masked) from whom during what part of the process and how code going to the SAS® compiler gets unquoted.

Examples will be used to enable you to develop the intuition needed to know what to quote, how to do it, and how to remove the quoting when it is needed. A minimum number of quoting functions will be introduced along the way to accomplish these tasks.

The student should have some experience writing SAS(r) code and at least a minimum knowledge of how to generate it using the macro facility. In particular the instructions %MACRO, %IF, %DO, %LET, and %PUT should be recognized along with some simple functions such as %UPCASE and %SUBSTR or %SCAN. Although the student should know the purpose of these tools, s/he need not have a great deal of experience using these tools.

The course is appropriate to any operating system and any SAS product which involves the need to understand and/or write code.

Introduction

The paper “A Serious Look at Macro Quoting” in the section Beyond Basics gives the background for this course. Hence the problems in this workshop may be viewed as examples for that paper.

Here are the lesson notes taken from the code for the exercises.

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Lesson 1:  Hiding symbols important to macro instructions
           at compile time.

           The only symbols important at compile time are
           ";" and single symbol of expected pair, e.g.
           quote marks or parentheses in appropriate context.

Lesson 2:  Macro quoting may persist in execution time.

           Comma is the outstanding problem since it
           separates arguments in functions and macros.

           Note: Choose %STR when you type the symbol.

Lesson 3:  Hiding symbols important to macro instructions
           at compile time.

           Quote marks are meaningful to the macro compiler.
           Quote marks are passed to SAS.
           %STR(%x) hides x where x is ', ", (, or ).

           Macro quoted quote marks are not automatically
           unquoted at the SAS boundary.

           %UNQUOTE explicitly unquotes macro quoted text.
           Some functions return unquoted values.
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Lesson 4:  Hiding macro triggers % and & at compile time.

           % triggers macro instructions, macro functions,
             and macro calls.
           & triggers macro expression resolution.

           %NRSTR is the tool.
           %UNQUOTE to allow execution.

           Which happens first % or &?

Lesson 5:  We have already seen that if the symbol is typed
           the %STR or %NRSTR can be used to hide the symbol.

           What happens when the symbol is the result of a
           macro call (or a macro function call), or a
           macro expression resolution?  We don't want to
           hide the call or the expression.  We want to hide
           its result.

           We cannot apply %STR or %NRSTR unless we are typing
           the symbol.  Since macro calls, macro function calls,
           and expression resolution do not take place at macro
           compile time this is a true execution time phenomenon.

           %EVAL does all logic and integer arithmetic processing.
           %EVAL is the target from which we must hide problem
           symbols.

           %EVAL is called implicitly wherever an integer or
           logical value is expected.

           %SUPERQ hides result of macro variable resolution
           NOTE: argument is variable name - not a reference.

Lesson 6: Summary

Lesson 7: Quoting can cause problems as well as solve them.

          Token mixup caused by quoting.
          Use %UNQUOTE as the cure.

Lesson 8: %BQUOTE quotes the result of evaluation or resolution.

          Two macro languages
          a. Open code language
          b. Macro compiled language
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