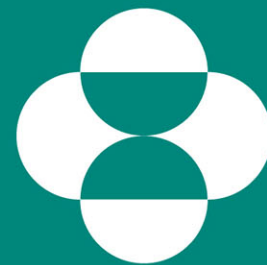


# A PRACTICAL GUIDE TO MACRO QUOTING AND WORKING WITH MACRO VARIABLES



**MSD**

**INVENTING FOR LIFE**

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# Agenda

- Introduction
- Masking tokens
- Macro quoting functions
- Data step
- Examples
- Conclusion
- Questions

# Introduction

- Whenever macro variables or macros are used there is often a need to mask tokens
- Best to mask all tokens and not only some
- Multiple functions to choose from
- Different tools
- A simplified view on macro quoting
- Recommendations

# Tokens

- Tokens are divided into 3 categories:
- Type I:
  - ❑ Operators {+ - \* / < > = ¬ ^ | ~}
  - ❑ Mnemonics {AND OR NOT EQ NE LE LT GE GT IN}
  - ❑ Miscellaneous {blank , ; “ ” ( ) #}
- Type II: Unmatched Characters {“ ‘ ( )}
- Type III: Macro Triggers {& %}
- Avoid unexpected results when value passed in a macro variable or a macro parameter

# Compilation and execution

- Compilation

```
%macro <macro name>;
```

```
<macro code>
```

```
%mend <macro name>;
```

- Execution

```
% <macro name>;
```

# Macro quoting functions

- %NRSTR() – used to mask tokens in compilation phase
- %NRBQUOTE() – used to mask tokens in execution phase
- %SUPERQ() – used to mask tokens until they are explicitly unmasked
- %UNQUOTE() – used to explicitly unmask a macro variable
- %QSCAN() – used to scan a macro variable with or without tokens
- %QSUBSTR() – used to extract a sub string from a macro variable with or without tokens

# Data step

- A powerful tool for processing macro variables
- `SYMGET()` – used to load a macro variable into a dataset variable
- `CALL SYMPUTX()` – used to create a macro variables in a data step
- `RESOLVE()` – used to unmask tokens within a data step - similar to `%UNQUOTE()` in macro language
- Beyond those 3 functions, values can be processed in the same way as any variable in a dataset

# Macro functions, Example 1

```
%macro test(var=);  
  %if &var=%NRSTR(New & old 's ) %then %put %NRSTR(%increase);  
  %else %put Wrong result;  
%mend test;
```

```
%test(var=%NRBQUOTE(New & old 's));
```

*>> %increase*

```
%test(var=%BQUOTE(New & old 's));
```

```
%test(var=%STR(New & old 's));
```

*>> ERROR: A character operand was found in the %EVAL function or %IF condition where a numeric operand is required. The condition was: &var=New & old 's*

*ERROR: The macro TEST will stop executing.*



# Macro functions, Example 2

```
%macro test(var=);  
  %if &var=%STR(New & old 's ) %then %put %NRSTR(%increase);  
  %else %put Wrong result;  
%mend test;
```

```
%test(var=%NRBQUOTE(New & old 's));
```

*>> ERROR: A character operand was found in the %EVAL function or %IF condition where a numeric operand is required. The condition was: &var=New & old 's*

*>> ERROR: The macro TEST1 will stop executing.*

# Example 3, main differences

```
data _null_;  
  CALL SYMPUTX('test1','%CI and &x1');  
run;
```

```
%macro test3(var=);  
  %put &var;  
%mend test3;
```

```
%test3(var=%NRSTR(&test1));
```

>>&test1

```
%test3(var=%NRBQUOTE(&test1));
```

>>WARNING: Apparent invocation of macro CI not resolved.

>>WARNING: Apparent symbolic reference X1 not resolved.

```
%test3(var=%SUPERQ(test1));
```

>>%CI and &x1

# Example 4, data step

```
%let x2=abc;
```

```
data _null_;
```

```
CALL SYMPUTX('test1','%CI and &x1');
```

```
CALL SYMPUTX('test2','"%CI and &x1"');
```

As in any case when using macro variables in a data step, double quotes will cause the macro triggers to resolve and produce

warnings

```
CALL SYMPUTX('test3','%CI and'||"&x2"');
```

To pass both triggers while only a macro variable is to be resolved, more complicated code needs to be used

```
test='%CI and &x1';
```

The value stored in a variable can be passed into a macro variable

```
CALL SYMPUTX('test4',test,'G');
```

Specifying the third parameter in CALL SYMPUTX as 'G' ensures that the macro variable is created as a global macro variable


```
run;
```



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# Example 5, advantages of using data step

```
data _null_;
  CALL SYMPUTX('test1','% Cl and "( . , &x1)');
run;
%let x1=abc;
%let new=%SUPERQ(test1);
```

```
%put &new;  >>% Cl and "( . , &x1
```

```
%put %UNQUOTE(&new);  >>
```

```
data _null_;
  length test test1 $80;
  test = SYMGET('new');  >>% Cl and "( . , &x1
  put test;
  test1 = RESOLVE(test);  >>% Cl and "( . , abc
  put test1;
run;
```

# Conclusions

- Use the newest macro language functions %NRSTR(), %NRBQUOTE() and %SUPERQ()
- Understand in detail what the differences between those three functions
- For complex operations use a data step

# THANK YOU

## Questions

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