Advanced Coding Skills: Renaming & Constructing Complex Variables

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Outline

- Why do we need to learn better coding techniques?
- Two types of data construction tasks:
  - Transformation on each of several variables
  - Transformation on the format of the data
- Key SAS or Stata commands for the tasks
  - Syntax rules of –array- in SAS
  - Syntax rules of –foreach- and –forvalues- in Stata
- Sample SAS and Stata codes
- Family structure codes using the do … loop commands
- Conclusions

Why Do We Need to Learn Better Coding Techniques?

- Better coding techniques give you:
  - o Efficiency: You use fewer lines of codes to complete tasks
  - o Accuracy: Fewer lines of codes reduce the possibility of making errors and make it easy to spot coding errors

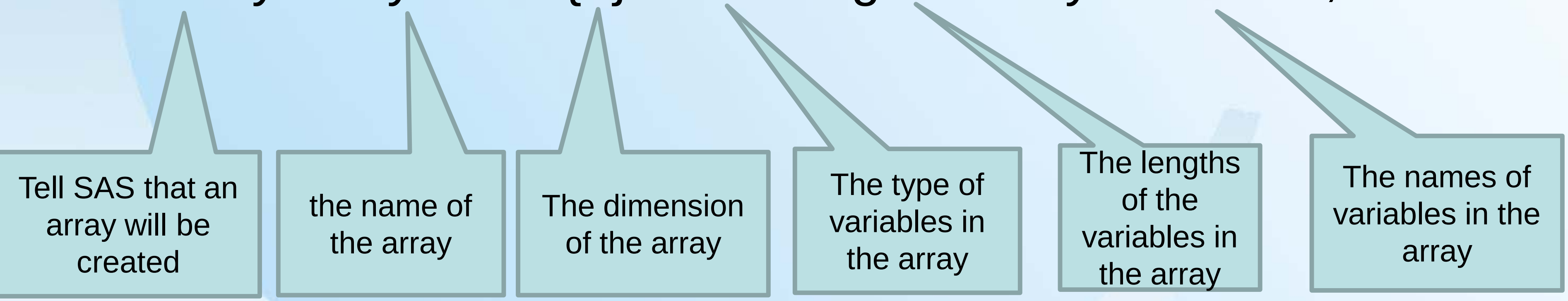
- We focus on the following tasks on multiple variables:
  - o Transform each of several variables
    - ▪ Rename variables
    - ▪ Recode the values of variables
    - ▪ Create new variables
  - o Transform the whole data set
    - ▪ Change data from wide to long format
    - ▪ Change data from long to wide format

- The use of -array- in SAS or -foreach- and –forvalues- in Stata are promising tools for better coding

Syntax Rules of -array- in SAS

- All variables specified within an array must be of the same type
- Variables specified within an array do not need to be already existing variables
- Syntax of specifying an –array-in SAS:

```
array array-name{n} <$> <length> array-elements;
```



Tell SAS that an array will be created

the name of the array

The dimension of the array

The type of variables in the array

The lengths of the variables in the array

The names of variables in the array

Syntax Rules of –array- in SAS

- After defining an array, you can specify what to do with each of the elements in the array

- Example:

(1)an one-dimension array, called “number,” contains five numeric variables from number1 to number5. The length of each of these variable has 3 digits

```
array number{5}         3  number1-number5;
array number{*}         3  number1-number5;
array number{1:5}       3  number1-number5;
array number{5}         3;
```

Syntax Rules of –array- in SAS

Tabe1. An example of an array references and variables

Array Reference	Variable Name
number{1}	number1
number{2}	number2
number{3}	number3
number{4}	number4
number{5}	number5

Syntax Rules of -array- in SAS

- Examples:

(2) an one-dimension array, called “character,” contains three string variables from string1 to string3. The length of each of these variable has 2 characters.

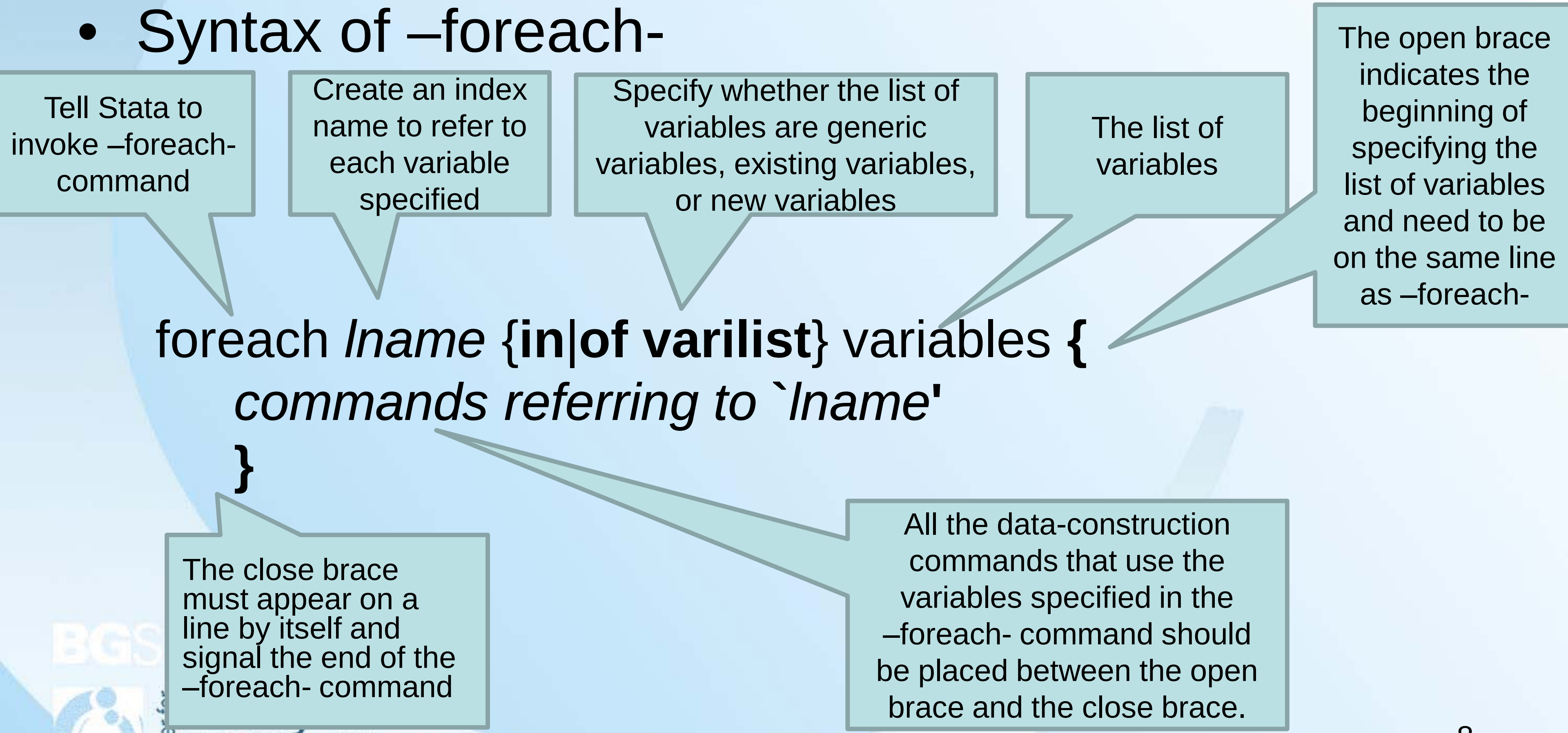
```
array character{3}  $  2  string1-string3;
```

(3) an two-dimension array, called “season,” contains 12 numeric variables that reflecting twelve months. The length of each of these variable has 1 digit.

```
array season{4,3}  1    January     February    March
                        April       May         June
                        July        August      September
                        October     November    December;
```

Syntax Rules of –foreach- in Stata

- There is no –array- command in Stata
- The -foreach- command has similar functions as one-dimension array in SAS
- Syntax of –foreach-



foreach *lname* {**in|of varilist**} variables **{**

commands referring to `lname'

}

Tell Stata to invoke –foreach- command

Create an index name to refer to each variable specified

Specify whether the list of variables are generic variables, existing variables, or new variables

The list of variables

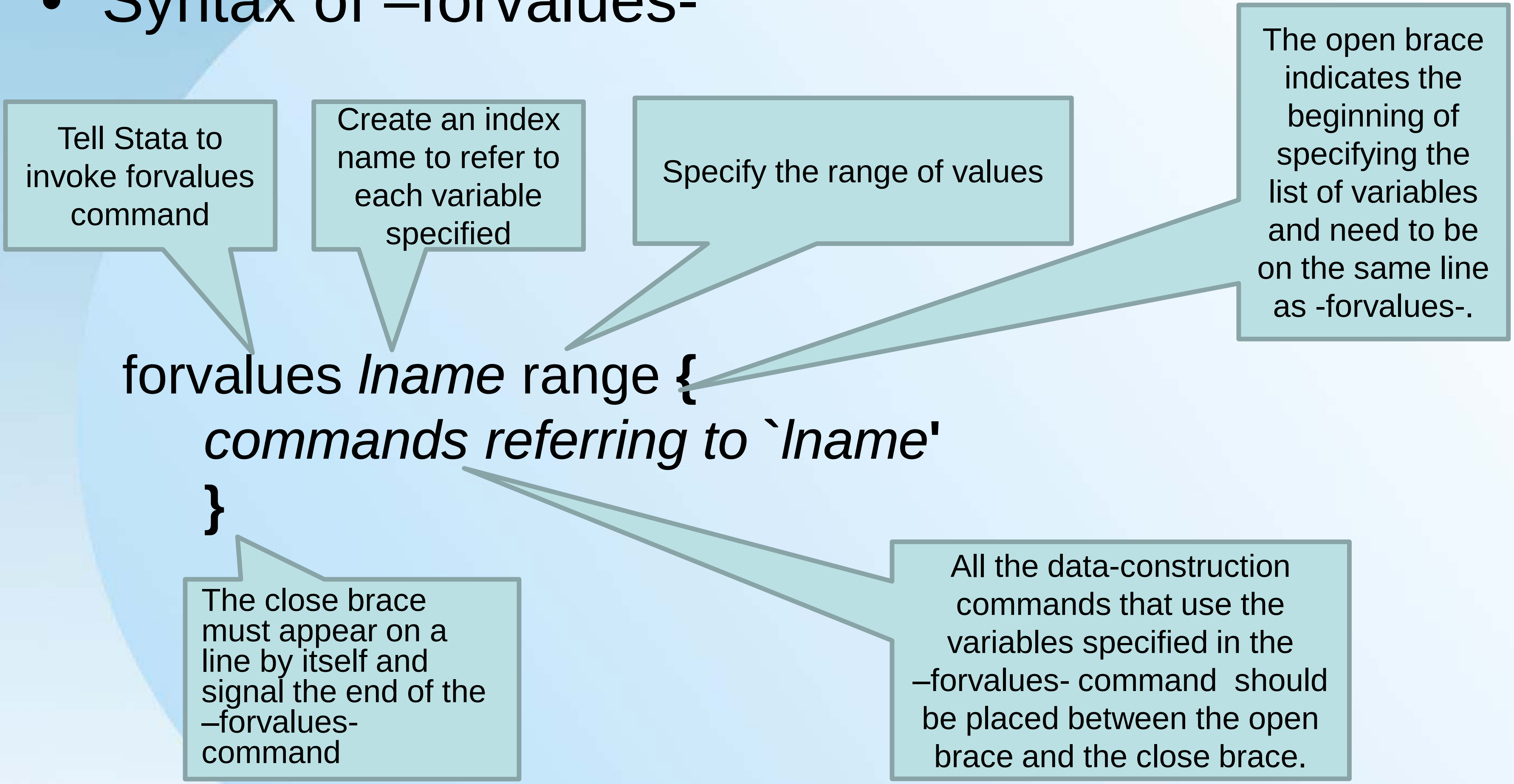
The open brace indicates the beginning of specifying the list of variables and need to be on the same line as –foreach-

The close brace must appear on a line by itself and signal the end of the –foreach- command

All the data-construction commands that use the variables specified in the –foreach- command should be placed between the open brace and the close brace.

Syntax Rules of -forvalues- in Stata

- Syntax of –forvalues-



Tell Stata to invoke forvalues command

Create an index name to refer to each variable specified

Specify the range of values

The open brace indicates the beginning of specifying the list of variables and need to be on the same line as -forvalues-.

forvalues *lname* range **{**

commands referring to `lname'

}

The close brace must appear on a line by itself and signal the end of the –forvalues- command

All the data-construction commands that use the variables specified in the –forvalues- command should be placed between the open brace and the close brace.

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Syntax Rules of -foreach- and –forvalues- in Stata

- Examples: An one-dimension array contains five existing numeric variables from number1 to number5. We use an index, i, to indicate the elements of this array:

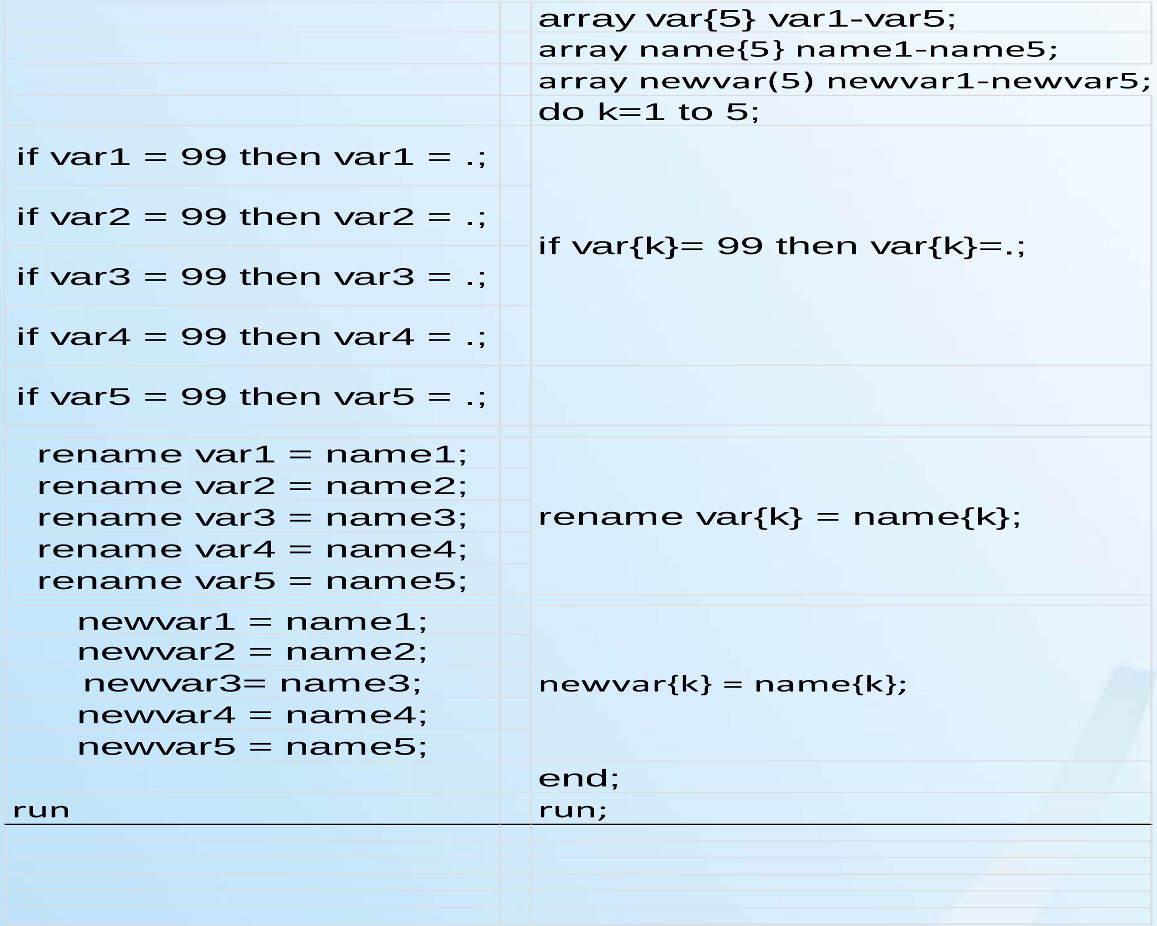
```
(1)  foreach i in number1 number2 number3 number4 number5 {
      display "`i'“
      list `i‘
      gen `i‘ =1
      }

(2) foreach i of varlist number1 number2 number3 number4 number5 {
      display "`i'“
      list `i‘
      gen `i‘ =1
      }

(3) forvalues i = 1(1)5 {
      list number`i’
      }
```

Sample SAS Codes

A. Recoding, renaming, and generating variables



		array var{5} var1-var5;
		array name{5} name1-name5;
		array newvar(5) newvar1-newvar5;
		do k=1 to 5;
if var1 = 99 then var1 = .;		if var{k}= 99 then var{k}=.;
if var2 = 99 then var2 = .;		
if var3 = 99 then var3 = .;		
if var4 = 99 then var4 = .;		
if var5 = 99 then var5 = .;		
rename var1 = name1;		rename var{k} = name{k};
rename var2 = name2;		
rename var3 = name3;		
rename var4 = name4;		
rename var5 = name5;		
newvar1 = name1;		newvar{k} = name{k};
newvar2 = name2;		
newvar3= name3;		
newvar4 = name4;		
newvar5 = name5;		
		end;
run		run;

Sample Stata Codes

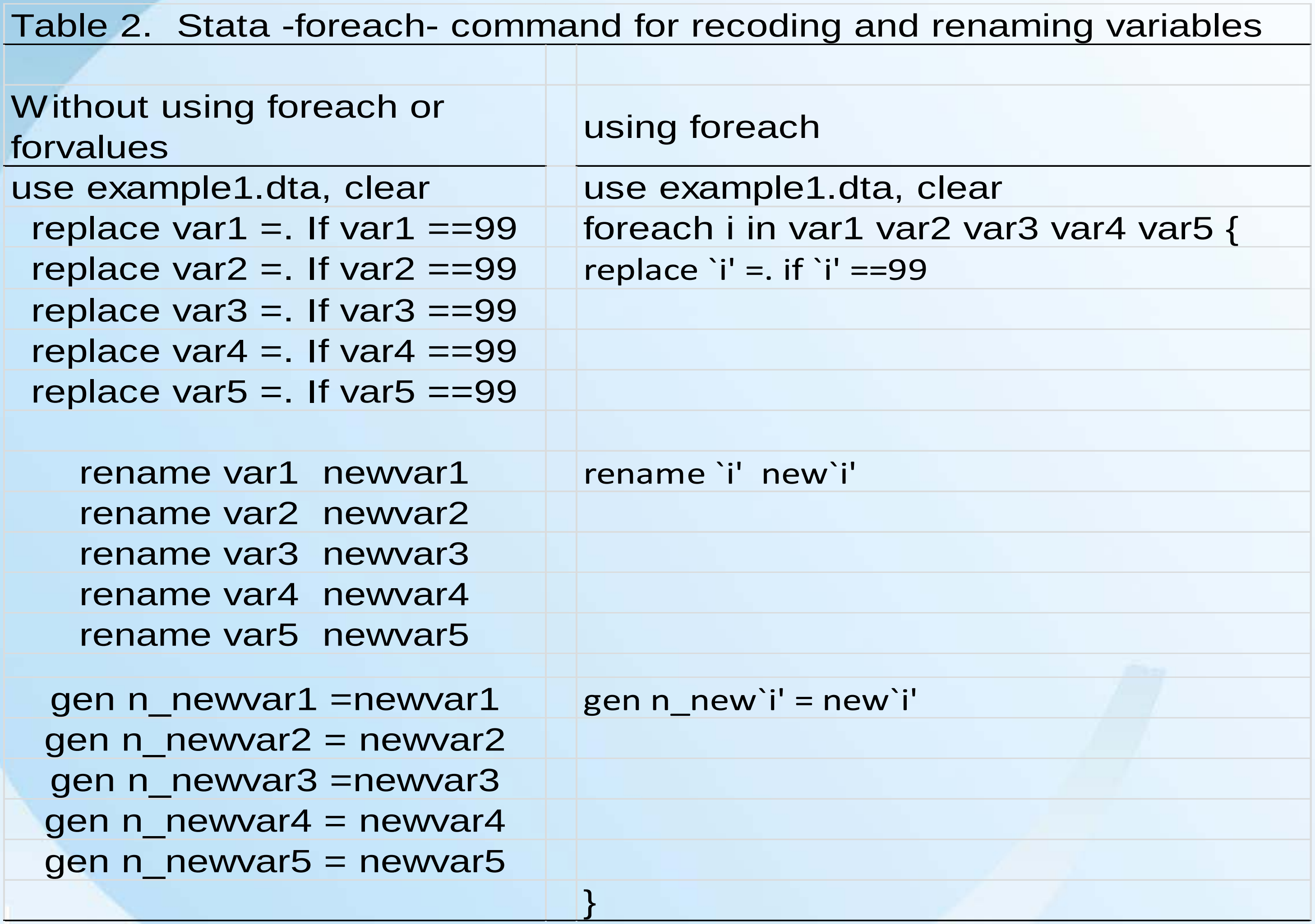


Table 2. Stata -foreach- command for recoding and renaming variables

Without using foreach or forvalues		using foreach
use example1.dta, clear		use example1.dta, clear
replace var1 =. If var1 ==99		foreach i in var1 var2 var3 var4 var5 {
replace var2 =. If var2 ==99		replace `i' =. if `i' ==99
replace var3 =. If var3 ==99		
replace var4 =. If var4 ==99		
replace var5 =. If var5 ==99		
rename var1 newvar1		rename `i'  new`i'
rename var2 newvar2		
rename var3 newvar3		
rename var4 newvar4		
rename var5 newvar5		
gen n_newvar1 =newvar1		gen n_new`i' = new`i'
gen n_newvar2 = newvar2		
gen n_newvar3 =newvar3		
gen n_newvar4 = newvar4		
gen n_newvar5 = newvar5		
		}

Sample Stata Codes

Table 3. Stata -forvalues- command for recoding and renaming variables and for generating new variables

Without using foreach or forvalues	using foreach
use example1.dta, clear	use example1.dta, clear
replace var1 =. If var1 ==99	forvalues i = 1(1)5 {
replace var2 =. If var2 ==99	replace var`i' =. if `i' ==99
replace var3 =. If var3 ==99	
replace var4 =. If var4 ==99	
replace var5 =. If var5 ==99	
rename var1 newvar1	rename var`i'  newvar`i'
rename var2 newvar2	
rename var3 newvar3	
rename var4 newvar4	
rename var5 newvar5	
gen n_newvar1 =newvar1	gen n_newvar`i' = newvar`i'
gen n_newvar2 = newvar2	
gen n_newvar3 =newvar3	
gen n_newvar4 = newvar4	
gen n_newvar5 = newvar5	
	}

Change Data Structure

- Data in wide and long format

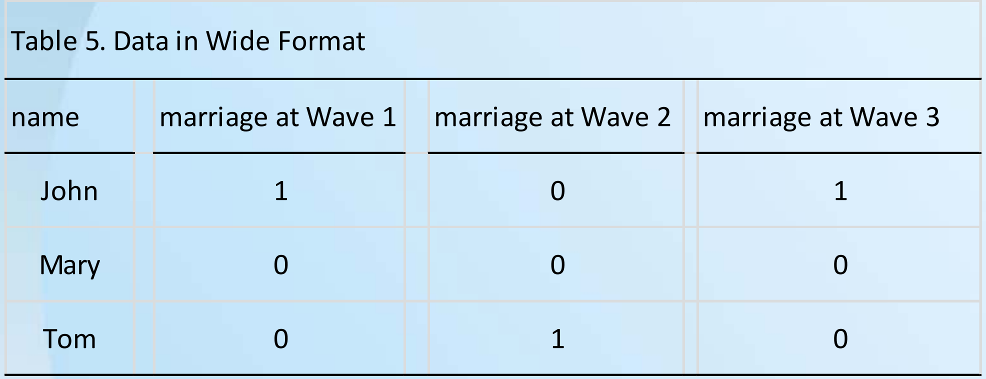


Table 5. Data in Wide Format

name	marriage at Wave 1	marriage at Wave 2	marriage at Wave 3
John	1	0	1
Mary	0	0	0
Tom	0	1	0

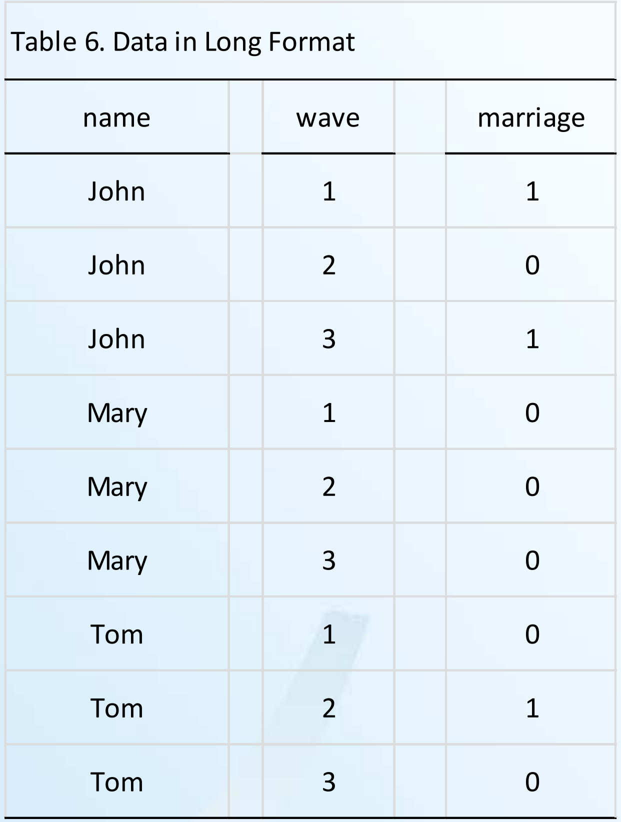


Table 6. Data in Long Format

name	wave	marriage
John	1	1
John	2	0
John	3	1
Mary	1	0
Mary	2	0
Mary	3	0
Tom	1	0
Tom	2	1
Tom	3	0

Change Data from Wide to Long Format in SAS

```
libname in 'c:\temp\array';
data in.long2;
set in.wide;
array status[3] marriage1 marriage2 marriage3;
do i=1 to 3;
Marriage = status[i];
output;
keep name i marriage;
end;
```

Change Data from Long to Wide Format in SAS

```
PROC SORT DATA=in.long2 OUT=in.long3 ;
BY name i ;
RUN ;
DATA in.wide2 ;
SET in.long2 ;
BY name ;
KEEP name marriage ;
RETAIN marriage1- marriage3 ;
ARRAY wave(1:3) marriage1 – marriage3 ;
IF first.name THEN DO;
        DO i = 1 to 3 ; wave (i ) = . ;
        END;
END;
Wave(year)= marriage;
IF last.name THEN OUTPUT ;
RUN;
```

Change Data Format in Stata

- Change data from wide to long format
  - **reshape long marriage, i(name) j(wave)**

- Change data from long to wide format
  - **reshape wide marriage, i(name) j(wave)**

Family Structure Codes Using the do … loop Commands

- See the accompany text file

Conclusions

- SAS and Stata have different commands for performing the same data construction on multiple variables.

- When working on few variables, you may not find it necessary to use these commands. However, when working on many variables at the same time, the necessity of using these commands becomes obvious.

- SAS users can also use the –array- command to transform the data between wide and long, while Stata users can use the –reshape- command, rather than –foreach- or -forvalues- to do so.
- The do…loop is another flexible tool to perform tasks on multiple variables

- It will be difficult at first to visualize how to use these commands to complete data construction tasks. When you have errors in your codes and do not know how to fix the codes, please contact me (wuh@bgsu.edu) or stop by my office during the office hours.