**Conduct Backward Selection in Multivariable Logistic Regression**

**Macro:** LOGREG\_SEL

**Created Date/Author** Oct. 19, 2012/Dana Nickleach

**Last Update Date/Person** Feb. 3, 2015/Yuan Liu

**Current Version**: V13

**Working Environment:** SAS 9.3 English version

**Contact**: Dr. Yuan Liu [yliu31@emory.edu](mailto:yliu31@emory.edu)

**Purpose:** To conduct backward selection on a logistic regression model using the maximum possible sample size at each stage of the selection process instead of restricting to the sample size from the first step as SAS does when using their selection methods. Optionally, a table of the resulting model can be generated.

**Notes:** The model is run using PROC LOGISTIC. A binary outcome or ordinal outcome using a cumulative logit model can be used, but not a nominal outcome. The final list of variables selected will be written to the log. Additionally, two global macro variables, \_finalvar and \_finalcvar will be created containing the list of all variables and categorical variables selected, respectively. If you are requesting a table with the model results then the macro “MUTLIPLE\_LOGREG V15” or later is also required. Interactions can be included to obtain the estimate of treatment effect (TRT) in each level of stratified variable (SV), and it is required both TRT and SV to be categorical variables. For variables selection, put TRT, SV, and TRT\*SV in the beginning of VAR; use INC = 3 to force the two main effects and their interaction in the model; use EFFECT = TRT and SLICEBY = SV to generate the stratified treatment odds ratio.

**Parameters:**

|  |  |
| --- | --- |
| **Macro variable** | **Description** |
| DSN | The name of the data set to be analyzed. |
| OUTCOME | The name of the outcome variable. It must be binary or ordinal. |
| EVENT | The event category for the binary response model. Specify the value in quotes. This is the argument that will be passed to the event= option in the model statement. Leave this blank if you have an ordinal outcome with more than 2 levels. |
| DESC | Set to T to reverse the order of an ordinal outcome (optional). The order will be based on the internal order. Only specify this if the EVENT parameter is blank. The default value is F. |
| VAR | List of variables to include in the model separated by spaces. |
| CVAR | List of categorical variables to include in the model separated by spaces. These should also appear in the var parameter. If you want to change the reference group you can follow each variable name by (desc) where needed. However, you will need to separate terms with an asterisk instead of a space. |
| INC | Number of variables to include in the model (optional). The first *n* variables in the var parameter will be included in every model. The default value is 0. |
| SLSTAY | The significance level for removing variables from the model (optional). The default value is .05. |
| WEIGHT | Variable to use in the weight statement (optional). Weights will be normalized to the original sample size using the normalize option. Leave it blank if not using weights. |
| REPORT | Set this to T if you want a table of the resulting model generated (optional). The default value is F. |
| TYPE3 | Set to F to suppress type III p-values from being reported in the table (optional). The default value is T. |
| EFFECT | Use to specify the treatment variable in the interaction. Use in combine with SLICEBY and if not empty, VAR should contain a two-way interaction. See example. |
| SLICEBY | Use in combine with EFFECT to specify the stratified variable in the interaction. |
| ORIENTATION | Orientation of the output Word table. Default is portrait, can be changed to landscape. |
| SHORTREPORT | Use in combine with EFFECT and SLICEBY when there is an interaction in the model and set to T to only report the stratified treatment effect. |
| FILENAME | File name for output table. This is necessary if report=T. |
| OUTPATH | File path for output table to be stored. This is necessary if report=T. |
| DEBUG | Set to T if running in debug mode (optional). Work datasets will not be deleted in debug mode. This is useful if you are editing the code or want to further manipulate the resulting data sets. The default value is F. |

**Usage Example:**

**DATA** analysis;

input id os\_censor Sex $ Age duration os progress $ trt $;

LABEL os = 'Overall Survival (months)'

progress = 'Progression'

trt = 'Treatment'

duration = 'Duration of Radiation';

DATALINES;

1 1 M 40 44 20 No B

2 1 F 45 46 16 Yes A

3 1 F 40 32 20 No B

4 1 F 47 32 23 No B

5 0 M 41 25 22 No B

6 1 M 54 35 13 No B

7 1 M 48 50 9 Yes A

8 1 M 36 33 12 Yes B

9 0 F 49 51 8 Yes A

10 1 M 49 52 10 Yes A

11 1 M 44 35 12 No A

12 1 M 49 50 8 Yes A

13 1 M 44 44 14 Yes A

14 1 M 50 31 10 Yes A

15 1 M 53 40 15 No B

16 0 M 52 29 20 Yes B

17 1 F 46 45 5 Yes A

18 1 F 37 44 11 Yes A

19 1 M 49 46 13 No B

20 1 M 42 31 11 No A

;

TITLE 'Table 4 Logistic Regression';

%logreg\_sel(dsn = analysis,

outcome = progress,

event = 'Yes',

var = Trt Sex Age Duration,

cvar = Trt Sex,

inc = 1,

slstay = .20,

report = T,

outpath = C:\Documents and Settings\User\My Documents\,

filename = Table 4 Logistic Regression);

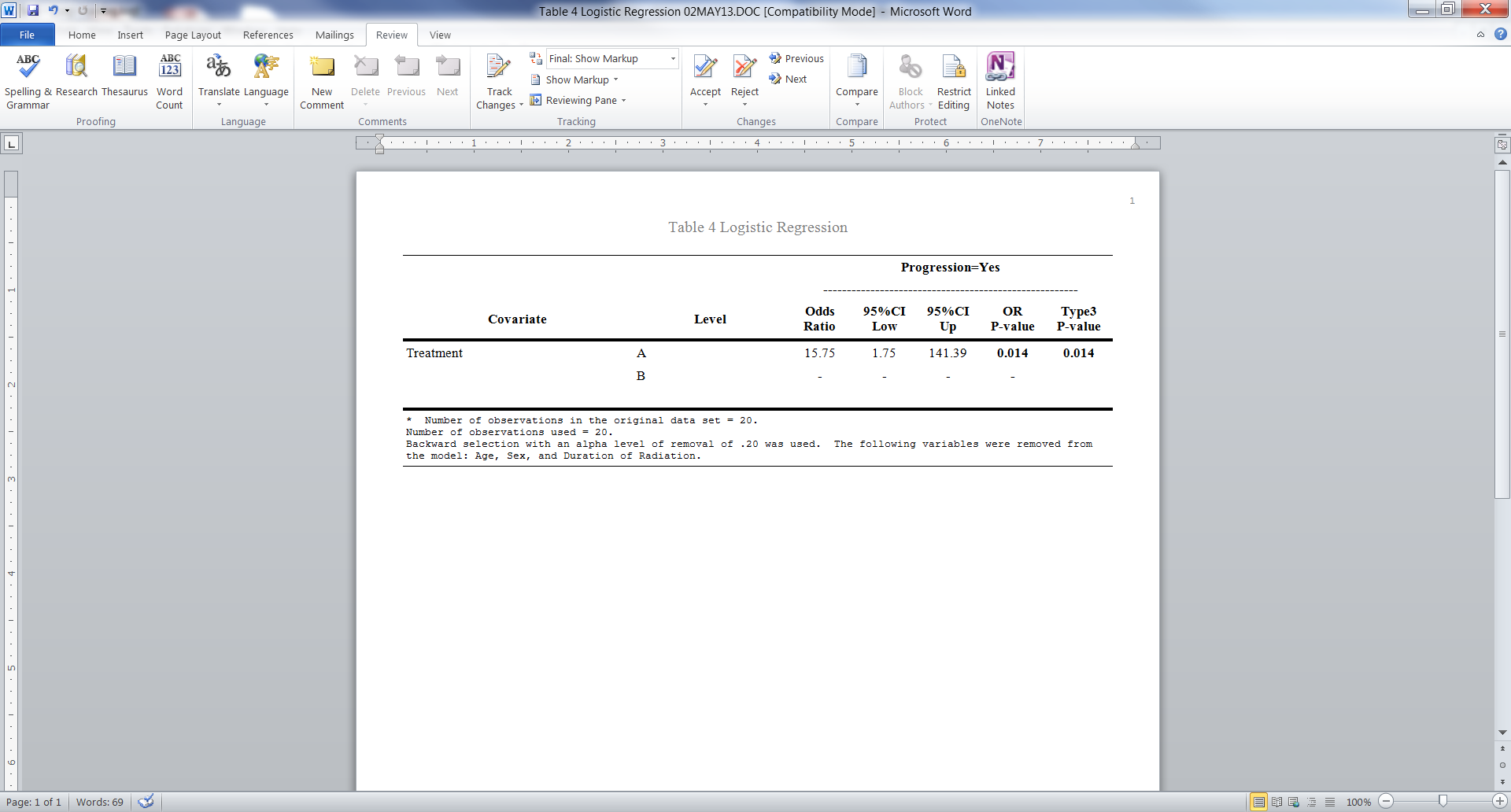
TITLE;

This message will be written in the log:

Categorical variables selected: TRT

All variables selected: TRT

**Summary Table Example:**



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**Log of Updates:**

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| --- | --- | --- | --- |
| **Date** | **By** | **Description** | **Version** |
| 10/19/12 | Dana Nickleach | Prevented case sensitivity of report parameter and modified counting of variables to only use spaces as a delimiter. | V2 |
| 11/2/12 | Dana Nickleach | Changed macro variable names holding final selection to be more unique in case the user needs to make them global. | V3 |
| 11/5/12 | Dana Nickleach | Added debug parameter. | V3 |
| 2/22/13 | Dana Nickleach | Updated to correspond with updates in multiple\_logreg V6. | V4 |
| 3/17/13 | Dana Nickleach | Added TYPE3 parameter. | V5 |
| 4/18/13 | Dana Nickleach | Fixed problem in update of variable list after variable removal and modified EVENT parameter so that it can also be used in the table header. | V6 |
| 5/3/13 | Dana Nickleach | Updated the call to MULTIPLE\_LOGREG based on the new version and fixed so that it will run without errors if there are no class variables. | V7 |
| 7/12/13 | Dana Nickleach | Updated the call to MULTIPLE\_LOGREG based on the new version, added creation of global macro variables holding final variable list, and set up to handle interaction terms in the selection process, not report. | V8 |
| 7/22/13 | Dana Nickleach | Added DESC parameter, option to change reference levels in CVAR, and added handling of ordinal outcomes. | V9 |
| 9/5/13 | Dana Nickleach | Declared macro variables as local. | V10 |
| 10/10/13 | Dana Nickleach | Fixed so that commas in the event label will not cause errors. | V11 |
| 2/6/14 | Dana Nickleach | Modified so that there are not restrictions on the length of variable names other than the SAS allowances. | V12 |
| 2/4/2015 | Yuan Liu | Allow interaction in the model and estimated stratified treatment effect; add EFFECT, SLICEBY, SHORTREPORT macro variables | V13 |