

High-Level Programming Tasks
Ratio of Means TABLING Addition
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Purpose

This document outlines the programming tasks required to implement the proposed application design.

Design Outline

Itemized tasks for this development are numbered in sequence of planned implementation.

Overview

Many features of the existing code modularization will remain intact. The primary change will be the addition of three code modules designed to parallel the function of the existing RANDOM, STRAT, and DOUBLE modules. These modules, however, will be designed to accept job specifications appropriate to the generation of separate ratio estimators. These newly constructed code modules will not replace the existing RANDOM, STRAT, and DOUBLE modules, but will instead be used in place of these existing modules when the user requests a ratio estimate.

Most modules that are modified will be brought into alignment with macro variable naming and macro invocation standards requiring use of explicitly passed invocation parameter values. These changes are expected to improve the clarity, robustness, testability and maintainability of the application.

Module Modifications

IN_CHK.SAS Module

The IN_CHK module will be modified and will be added to TABLING execution to provide the error messages outlined in the analysis stage document "Interface Standards".

1. References to macro variables defined within the TABLING macro's referencing environment should be changed to include the prefix "t_".
2. Add statements to detect the specification of more than one variable name in the "su_attr" invocation variable, if value of "est_method" is "ratio_s". If this situation is found, print a warning message to the user and set the output value of the macro to "WARNING" or "NOTE".

(Return of an "ERROR" value is to be avoided, as the TABLING module will abort the job in this case.)

TABLING.SAS Module

The TABLING module, which is responsible for overall control and operation of subsidiary code modules in the application will need to be modified to handle the additional job parameters required for ratio estimators.

3. Change names of invocation macro variables to meet stated naming standards for macro variables. Specifically, add "t_" prefixes to all local macro variables and their references.
4. Macro statements must be added to separate the two variable names provided by the user in the value of the "t_su_attr" invocation parameter. This separation should function regardless of the

estimation method specified. However, for estimation methods other than “ratio_s”, only the first variable listed in the “t_su_attr” value will be used to generate population estimates.

- a. If two variables are erroneously specified in a non-ratio estimation job, remove the 2d variable name from t_su_attr. This will allow existing modules to operate with minimal modification.
 - b. If two variables are specified in a ratio estimation job, move the 2d variable name to a t_su_attr_denom macro variable
5. The section of code which calls the appropriate estimation macro (“%&method” statement – line 114) will be changed to employ macro “%IF...” statements to execute the new RANDOM_RS, STRAT_RS, and DOUBLE_RS modules. Other modules will be invoked as in the present application.

Invocations of newly constructed macros will explicitly specify job parameters passed from the main TABLING module.

6. Execution of the “in_chk” macro will be implemented by changing the “%*IF %in_chk...” statement at line 111 from a comment to a functioning SAS macro statement.

GET_OB.SAS Module

The GET_OB module is responsible for extracting analysis observations from the input data sets used to provide sample evaluation data. This module is used only when census or simple stratified random sampling designs are used.

This module must be altered to extract either one “sample unit attribute” variable from the input data sets (for estimating sample unit means or simple population totals) or two “sample unit attribute” variables (as required for generation of a ratio estimate).

7. Change names of invocation macro variables to meet stated naming standards for macro variables. Specifically, add “go_” prefixes to all local macro variables.
8. References to macro variables defined within the TABLING macro’s referencing environment should be changed to include the prefix “t_”.
9. Modify to accept and extract up to two variables from the target input data set.

The sample unit characterization variable names passed to the macro will be contained in macro variables t_su_attr (numerator) and t_su_attr_denom (denominator). If a non-ratio estimation method is selected, t_su_attr_denom will be empty.

GET_OB_S.SAS Module

The GET_OB_S module is current responsible for extracting analysis observations from the input data sets used to provide sample evaluation data. This module is used only when stratified random or double sampling for stratification designs are used.

This module must be altered to extract either one OR two sample unit description variables from the input data sets, as appropriate. For estimating sample unit means or simple population totals, one variable should be extracted. For generation of a ratio estimate, two sample unit description variables should be extracted.

10. Change names of invocation macro variables to meet stated naming standards for macro variables. Specifically, add “gos_” prefixes to all local macro variables.

11. References to macro variables defined within the TABLING macro's referencing environment should be changed to include the prefix "t_".
12. Modify to accept and extract up to two variables from the target input data set.

The sample unit characterization variable names passed to the macro will be contained in macro variables t_su_attr (numerator) and t_su_attr_denom (denominator). If a non-ratio estimation method is selected, t_su_attr_denom will be empty.

CENSUS.SAS Module

13. Modify invocation statement for GET_OB macro to explicitly pass job parameters required by that macro.
14. Names of invocation macro variables passed to GET_OB must meet stated naming standards for macro variables. Specifically, add "go_" prefixes to all local macro variables.
15. References to macro variables defined within the TABLING macro's referencing environment should be changed to include the prefix "t_".

RANDOM.SAS Module

16. Modify invocation statement for GET_OB macro to explicitly pass job parameters required by that macro.
17. Names of invocation macro variables passed to GET_OB must meet stated naming standards for macro variables. Specifically, add "go_" prefixes to all local macro variables.
18. References to macro variables defined within the TABLING macro's referencing environment should be changed to include the prefix "t_".

STRAT.SAS Module

19. Modify invocation statement for GET_OB_S macro to explicitly pass job parameters required by that macro. Only the first variable name specified by the user in the "t_su_attr" invocation parameter should be passed to the GET_OB_S macro.
20. Names of invocation macro variables passed to GET_OB must meet stated naming standards for macro variables. Specifically, add "gos_" prefixes to all local macro variables.
21. References to macro variables defined within the TABLING macro's referencing environment should be changed to include the prefix "t_".

DOUBLE.SAS Module

22. Modify invocation statement for GET_OB_S macro to explicitly pass job parameters required by that macro. Only the first variable name specified by the user in the "t_su_attr" invocation parameter should be passed to the GET_OB_S macro.
23. Names of invocation macro variables passed to GET_OB must meet stated naming standards for macro variables. Specifically, add "gos_" prefixes to all local macro variables.
24. References to macro variables defined within the TABLING macro's referencing environment should be changed to include the prefix "t_".

RANDOM_RS.SAS Module

This module will be designed to generate tables of ratio estimates as specified by the user-provided job parameters in cases where a simple random sample design is indicated.

“RS” in the module name indicates “Ratio estimator – Separate”. In this case “separate” refers to the fact that an estimate derived from combination of independent subpopulation samples will be formed as if the subpopulations constituted different strata in a stratified sampling design – the population estimator will be a separate ratio estimator formed from individual ratios estimated for each subpopulation.

25. Copy modified version of RANDOM.SAS module, rename to RANDOM_RS.SAS
26. The RANDOM_RS code module should be modified to require explicit passing of job parameters via invocation macro variables via labeled invocation variables.
27. Modify invocation statement for GET_OB macro to explicitly pass job parameters required by that macro.

The first variable name specified by the user in the “t_su_attr” invocation parameter should be passed to the GET_OB macro as the numerator of the ratio estimate, as the value of macro variable t_su_attr..

The second variable name specified by the user in the “t_su_attr” invocation parameter should be passed to the GET_OB macro as the denominator of the ratio estimate, as the value of macro variable t_su_attr_denom.

28. All macro variables created within the module’s referencing environment should have a prefix of “rrs_”.
29. Names of invocation macro variables passed to GET_OB must meet stated naming standards for macro variables. Specifically, add “go_” prefixes to all local macro variables.
30. References to macro variables defined within the TABLING macro’s referencing environment should be changed to include the prefix “t_”.
31. Estimation calculations must be altered to produce:
 - a. A ratio estimate for each subpopulation,
 - b. a weighted mean of subpopulation estimates representing the estimated value of the ratio parameter over the complete target population, and
 - c. an estimated error for the target population’s estimate.
 - i. The pearson correlation of numerator and denominator statistics must be added to the list of descriptive statistics accumulated for each subpopulation.
 - ii. The estimated value of the ratio statistic must be added to the list of descriptive statistics accumulated for each subpopulation
 - iii. The sample standard deviations of both numerator and denominator statistics must be added to the list of descriptive statistics accumulated for each subpopulation.

STRAT_RS.SAS Module

This module will be designed to generate tables of separate ratio estimates as specified by the user provide job parameters in cases where a stratified random sample design is indicated.

“RS” in the module name indicates “Ratio estimator – Separate”.

32. Copy modified version of STRAT.SAS module, rename to STRAT_RS.SAS

33. Modify invocation statement for GET_OB_S macro to explicitly pass job parameters required by that macro.

The first variable name specified by the user in the “su_attr” invocation parameter should be passed to the GET_OB_S macro as the numerator of the ratio estimate, as the value of macro variable t_su_attr..

The second variable name specified by the user in the “su_attr” invocation parameter should be passed to the GET_OB_S macro as the denominator of the ratio estimate, as the value of macro variable t_su_attr_denom.

34. All macro variables created within the module’s referencing environment should have a prefix of “srs_”.

35. Names of invocation macro variables passed to GET_OB_S must meet stated naming standards for macro variables. Specifically, add “gos_” prefixes to all local macro variables.

36. References to macro variables defined within the TABLING macro’s referencing environment should be changed to include the prefix “t_”.

37. Estimation calculations must be altered to produce:

- a. A ratio estimate for each stratum,
- b. a weighted mean of stratum estimates representing the estimated value of the ratio parameter over the complete target population, and
- c. an estimated error for the target population’s estimate.
 - i. The Pearson correlation of numerator and denominator statistics must be added to the list of descriptive statistics accumulated for each stratum.
 - ii. The estimated value of the ratio statistic must be added to the list of descriptive statistics accumulated for each stratum
 - iii. The sample standard deviations of both numerator and denominator statistics must be added to the list of descriptive statistics accumulated for each stratum.

DOUBLE_RS.SAS Module

This module will be designed to generate tables of separate ratio estimates as specified by the user provide job parameters in cases where a double sampling for stratification sample design is indicated.

“RS” in the module name indicates “Ratio estimator – Separate”.

38. Copy modified version of DOUBLE.SAS module, rename to DOUBLE_RS.SAS

39. Modify invocation statement for GET_OB_S macro to explicitly pass job parameters required by that macro.

The first variable name specified by the user in the “su_attr” invocation parameter should be passed to the GET_OB_S macro as the numerator of the ratio estimate, as the value of macro variable t_su_attr.

The second variable name specified by the user in the “su_attr” invocation parameter should be passed to the GET_OB_S macro as the numerator of the ratio estimate, as the value of macro variable t_su_attr_denom.

40. All macro variables created within the module’s referencing environment should have a prefix of “drs_”.
41. Names of invocation macro variables passed to GET_OB_S must meet stated naming standards for macro variables. Specifically, add “gos_” prefixes to all local macro variables.
42. References to macro variables defined within the TABLING macro’s referencing environment should be changed to include the prefix “t_”.
43. Estimation calculations must be altered to produce:
 - a. A ratio estimate for each stratum,
 - b. a weighted mean of stratum estimates representing the estimated value of the ratio parameter over the complete target population, and
 - c. an estimated error for the target population’s estimate.
 - i. The pearson correlation of numerator and denominator statistics must be added to the list of descriptive statistics accumulated for each stratum.
 - ii. The estimated value of the ratio statistic must be added to the list of descriptive statistics accumulated for each stratum
 - iii. The sample standard deviations of both numerator and denominator statistics must be added to the list of descriptive statistics accumulated for each stratum.

REPOUT.SAS Module

44. This module should be altered to ensure that a correct explanation of the calculated population estimates is provided in title statements etc. At present, this function depends on the value of t_su_attr. This may need to be changed to make simultaneous use of macro variables t_su_attr and t_su_attr_denom when ratio estimators are generated.