

Everyone Trying to Update at the Same Time? Let's Try the Source Control Manager! (SAS/AF® Development Tool)

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ABSTRACT

The SAS/AF development tool source control manager (SCM) is a source file management facility featuring SAS file check-out/check-in capability. This feature allows several developers to have edit access to the same files, while ensuring that no one makes changes to a program while another developer is making changes to the same program. It is designed to be used with SAS/SHARE®.

The Standard Economic Processing System (StEPS), a batch and SAS/AF system developed by the U.S. Census Bureau for processing data from its economic surveys, is a prime candidate for SCM. It is maintained by several developers requiring edit access to its files. This paper describes how SCM has been implemented for StEPS, providing a basis for how it can be used by other organizations.

INTRODUCTION

The source control manager is an application providing source file management for applications development using SAS/AF. Its features include a convenient GUI interface, SAS file check-out/check-in capabilities, and revision control. It allows a team of software developers accessing the same catalog entries, to update files using a check-out/check-in procedure. This prevents individual users from attempting updates at the same time. The application is designed to be used with SAS/SHARE. In maintaining StEPS code we have experienced instances when "almost" simultaneous updates result in loss of intermediate versions of program code. These occurrences motivated the implementation of SCM in our system. Although SAS/SHARE provides a message when update is attempted while another user is accessing a file, this was insufficient for our development needs.

An important feature of SCM is revision control. This refers to the creation of a backup for each file after check-in. The concept of backup is very important in any file system, and StEPS had developed a custom macro (%saveold) for our catalog entry backup prior to introducing SCM. However, the use of this macro is manual, and would not provide a complete record of code updates (if two users happen to be updating the same program at nearly the same time).

In the following sections, we give a brief overview of StEPS, as it relates to SCM, and describe installation and usage of SCM based on our experience with it in StEPS. For installation, we referred to the SAS System Help documentation on SCM installation, while creating our own sets of instructions as these related to StEPS. These sets of instructions are available upon request, from the author.

StEPS

StEPS is a generalized system developed in the Economic Directorate of the U.S. Census Bureau, to process the data from over 100 current economic surveys. As mentioned above, it is a batch and SAS/AF system. We introduced SCM on our development machine, for source file management of the catalog entries of the system, for which SCM is designed. Although StEPS

uses many libraries for the data it processes, most of its program code is contained in the library PROGRAMS. This library contains the catalogs just mentioned. The main interactive SAS/AF screen for StEPS is shown in Figure 1 below.

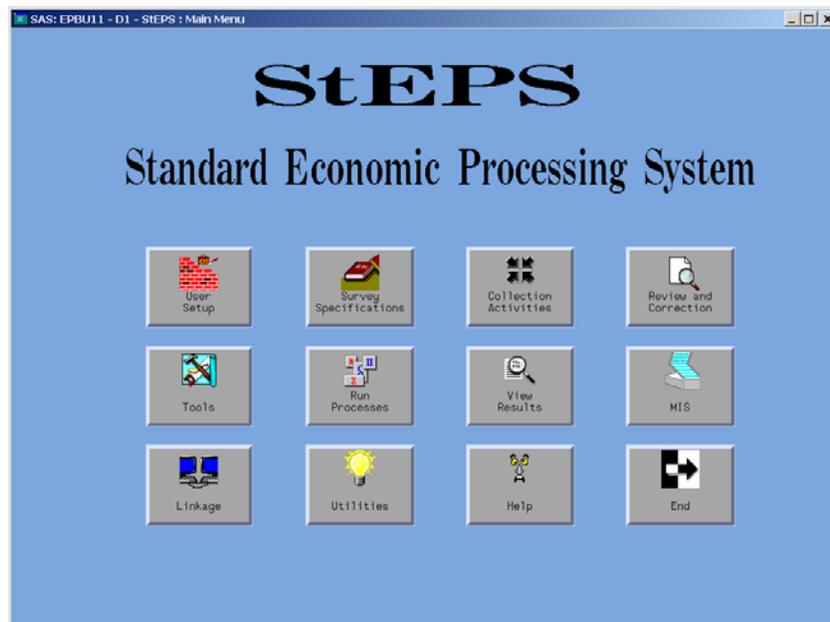


Figure 1

Maintenance of the system is performed by a team of developers in a branch dedicated to StEPS development, along with several other branches of developers devoted to surveys whose data StEPS processes. Attempts at simultaneous access to the many catalog files in StEPS by these developers sometimes causes unintended code overwrites, making StEPS an ideal candidate for SCM.

INSTALLING SCM (an example using StEPS)

The installation of SCM described in this section is from an administrator viewpoint. It assumes a SAS/SHARE server for SCM is running. The main parts of installation are:

- SCM directory setup
- Invoking SAS
- SCM Administration Wizard
- Setting up user ID
- Registering Program Files

SCM DIRECTORY SETUP

The first step of SCM installation is to create a directory in which the SCM control database (CDB) will reside. The CDB is a set of SAS data sets containing information about our usage of SCM. Some of the data set information is used for some of the SCM operations. For example, ARCHIVES contains the names of previous versions of programs we make updates to, and is used by the application if we are reverting to a previous version of a program. The HISTORY data set provides the information we enter as we check a program back into the application, giving details on the update we made to the program.

We assume here that we are using SCM with a UNIX® operating system, so we create the directory as follows, assuming we are starting in the directory, /steps:

```
mkdir scm
cd scm
mkdir cdb
```

INVOKING SAS®

In StEPS, we work in an xwindows environment, usually invoking SAS from a common menu, using a common autoexec file which creates many of the LIBNAMEs required by StEPS. (Invoking SAS can also be done by typing whatever command your system administrator has set up for your organization.) After invoking SAS, the next steps in preliminary installation of SCM are:

- Clear the LIBNAME for the directory containing catalogs of interest (in our case, the PROGRAMS libname): *libname programs clear;*
- Assign the LIBNAME 'SCMCDB' for the library containing the SCM control database: *libname scmcdb '/steps/scm/cdb' server=steps;* (Note that we assume we are using a library on a SAS/SHARE server for our CDB.)
- Invoke SCM (by typing 'scm') either on the program editor command line, or in the Toolbox: Explorer Window. This gives us the SCM – Initial Allocation Window, shown in Figure 2 below:

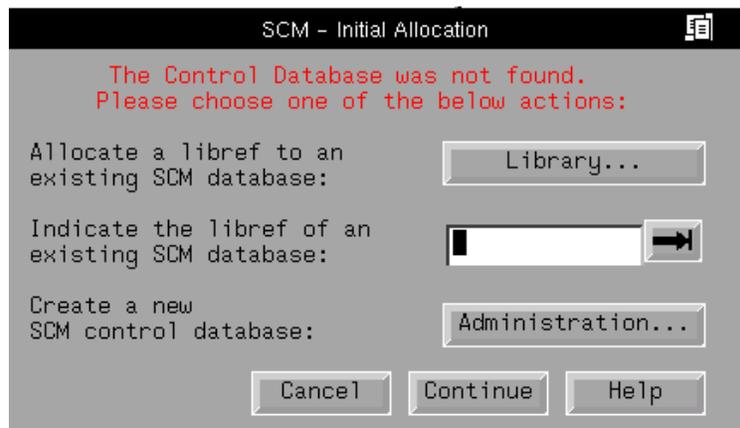


Figure 2

SCM ADMINISTRATION WIZARD

The SCM administration wizard, as with installation wizards in general, easily guides the user through the steps of creating a new control database. While going through the wizard, the user specifies three important things:

- The library where the control database will be located.
- How many revisions will be stored.
- Data sets where user preferences will be stored in SASUSER.

The user clicks on the “Administration...” button in Figure 2 above, to get the administration wizard started. Due to lack of space, the screens of the administration wizard corresponding to the above properties are not shown here, but can be seen in the sets of instructions we

developed, referred to in the introduction. After we go through the administration wizard, we have created a new, empty SCM database.

SETTING UP USER ID

After setting up the new SCM database, we need to set up a user ID, before proceeding to the next step. This must be done so SCM will recognize us when we enter the application. To set up the user ID, we go back into SCM as we had originally done, described in the Invoking SAS section above, by typing 'scm' on the program editor command line or in the Toolbox: Explorer Window. Then we get the SCM – Initial Allocation Window again (Figure 2 above).

In the “SCM – Initial Allocation” window click the  button and a “Select a Library” window appears. In the “Select a Library” window, select the “ScmcdB” library, and the following window appears:



Figure 3

Type in a user ID in the “User ID:” field and press the “OK” button. The “Team Libraries:” window appears (shown below).



Figure 4a

REGISTERING PROGRAM FILES

In order to be able to use SCM to update program files, we must register our program files in SCM. This consists of a few simple steps:

- Assigning the StEPS PROGRAMS library to the SAS/SHARE server: *libname programs /steps/programs' server=steps;*
- Specifying the location of the team library and archive location under the Tools menu in the Team Library Window.
- After registering the program files, we get an updated Team Libraries Window, as shown in Figure 4b below:

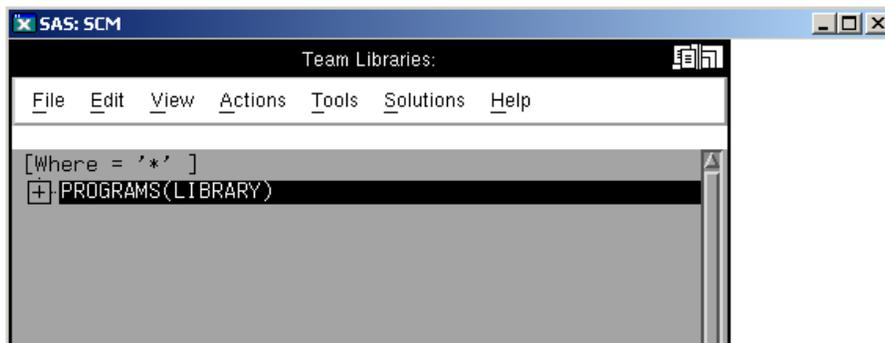


Figure 4b

USING SCM (from a developer perspective)

Developer usage of SCM described here is divided into two parts: one time setup, and normal use.

ONE TIME SETUP

Developers are given a simple set of instructions for creating their user ID, and setting up initial directory mappings and file options.

Setting up User ID

Invoking SAS the first time after the administrator has installed SCM, they get the SCM – Set User ID screen shown above in Figure 3. After they type in an assigned user ID, and click the “OK” button, SCM registers them as SCM users, and creates SASUSER files referred to above, in the SCM Administration Wizard section.

The Team Libraries Window appears, showing the programs library (Figure 4b). The developer can expand the library to show the catalogs it contains, by clicking the ‘+’ on the left. Doing so, they get the following screen:

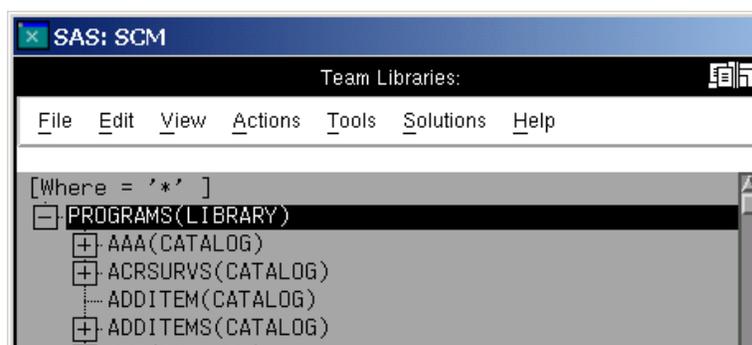


Figure 5

Setting up the Local Window

The developer next needs to setup the Local Window. The Local Window is where local programs reside. Two operations have to be accomplished for the Local Window: library mapping, and optionally, local file deletion after check in, to preserve space in the developers local area.

Library Mapping: By clicking on Tools>Options in the Team Window, and SCM – Options Window appear, with several tabs, including 'Library Mappings'. In the 'Library Mappings' tab, the user specifies the local directory files should be checked out to.

Local File Deletion after Check in: By clicking on the 'Options' tab in the SCM – Options Window, the user can click on a radio box to indicate that local files should be deleted after the check in command.

NORMAL USE

Developers are given a set of instructions for:

- Development in sessions where updating is not done.
- Checking programs out and in.
- Creating and registering catalogs and entries.

Development in sessions where updating is not done

These instructions are specific to StEPS, and not part of the SCM documentation. There has been concern in StEPS that, since SCM requires the programs library to be read/write, developers might unintentionally overwrite existing programs. In the past this library has been read only. Developers would only change the protection at the time they copy their programs into it.

To prevent unintentional overwrites, developers are instructed to exit from SCM after entering SAS, by clicking on File>Close in the Team Libraries Window. This de-assigns the programs library. They then submit the following line of code from the Program Editor Window of the SAS session:

```
libname programs "&programs" server=&stpserv access=readonly;
```

Figure 6

Checking programs out and in

As mentioned above, one of the main premises of SCM is the prevention of simultaneous updates to programs by different developers at the same time. In order to accomplish this, the developer checks out a program the Local Window to do updates, and then checks it back in to the Team Libraries window when finished updating. During this process, the developer is locking and copying the SAS/AF entry or catalog from the Team, to the Local Window.

Checking out a program

After selecting a file, by clicking on it to highlight it, the user clicks on Actions>Check Out in the Team Window, to check the file out to the Local Window. Alternatively, the "Check Out" icon (arrow pointing down) in the Toolbox: Explorer window can be clicked to check the file out. The file will then appear in the Local Window if the user brings that window up.

After the file has been checked out, a blue padlock icon will appear to the left of it in the Team and Local Windows for the user who has the file checked out. Other users will see a gray padlock icon in front of the file in the Team Window on their screens. The Team Window with a file locked is shown in the following:

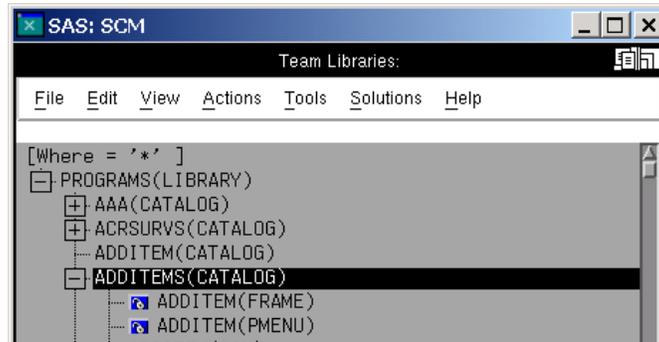


Figure 7

Checking in a program

After finishing updates, the user checks the program back into the Team Library Window by clicking on Actions>Check In in the Local Window. As with check out, alternatively, the "Check In" icon (arrow pointing up) in the Toolbox: Explorer window can be clicked to check the file in.

After check in, the user is forced to enter a change description in the "SCM – Change Description" window as shown:

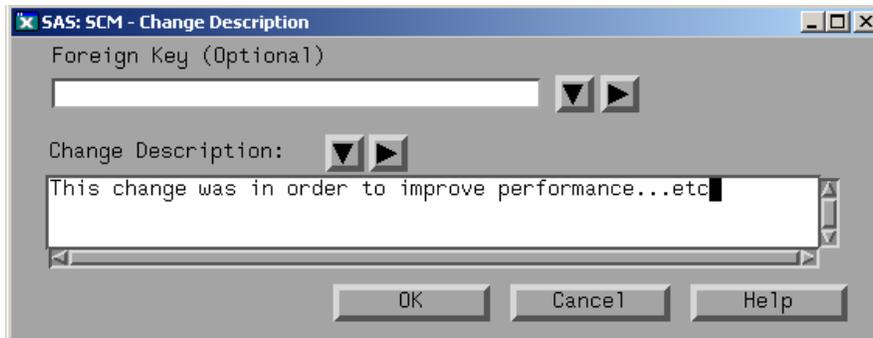


Figure 8

The information entered into this screen is put into the HISTORY data set in the library containing the SCM control database.

Creating and registering catalogs/entries in the Team/Local Windows

The developer may have a need to create a new catalog and entries, or new entries for an existing catalog. In either case, the user first goes to the Local Window, and Edit>New... on the menu. This gives the following screen, with the new catalog and entry shown. The user clicks on 'Create.'

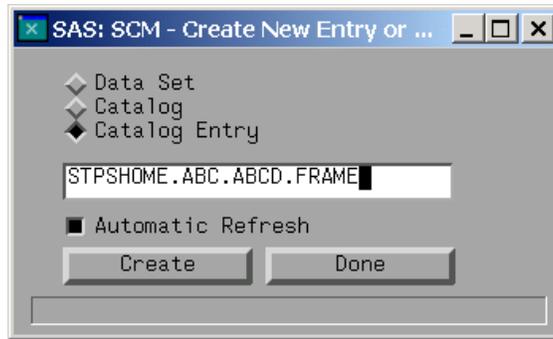


Figure 9

For a new frame and scl entry, the familiar frame entry displays. The frame and corresponding scl entry are edited as usual. After saving the new entries, the user gets a message that the file already exists in the Create New Entry or Member window above. Ignore this, and Click the 'Done' button. Finally, compile the frame in the Local Window as usual, by going to Tools>Compile.

Next, you must copy the new catalog and entries to the SCM Team Window. In the Local Window, making sure the new catalog is highlighted, got the Actions>Copy To... on the menu. The SCM – Copy Selection(s) window comes up, as shown below. Specify the new catalog, along with library as shown, and click 'OK.'

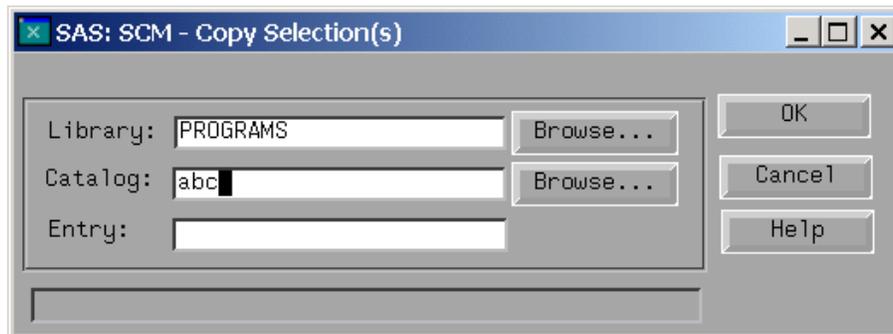


Figure 10

Registering new catalogs in the Team Window

Before the new catalog will show up in the Team Window, it must be registered in SCM. This is accomplished by going to Tools>Administration Utilities>Source Data. After entering the information shown below, click the 'Register' button. When registration is complete the screen will appear as shown below. Click 'OK.'

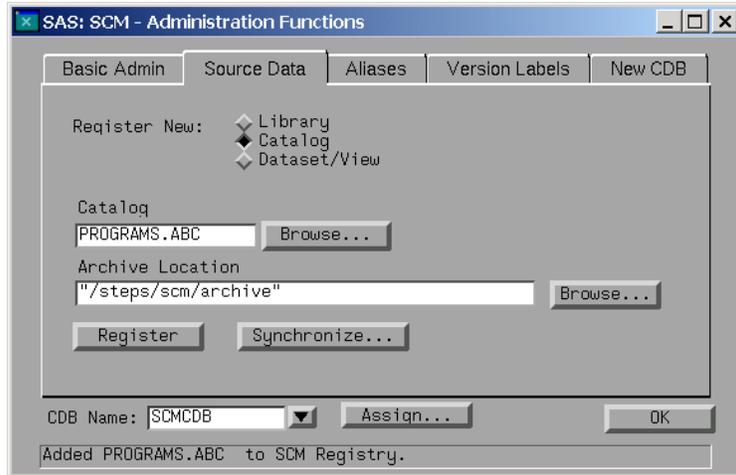


Figure 11

Back in the Team Window, click View>Refresh to get the new catalog to show up in the PROGRAMS library.

Creating new entries in existing catalogs in the Team Window

This process is similar to the above one. After the entry is created in the Local Window, the user copies the entries to the Team Window, as shown using the screen in Figure 10 above. Back in the Team Window, the user must register the new entries, before they will show up. From the menu, go to Tools>Administration Utilities>Source Data, as before to get the following screen. Information is entered as shown:

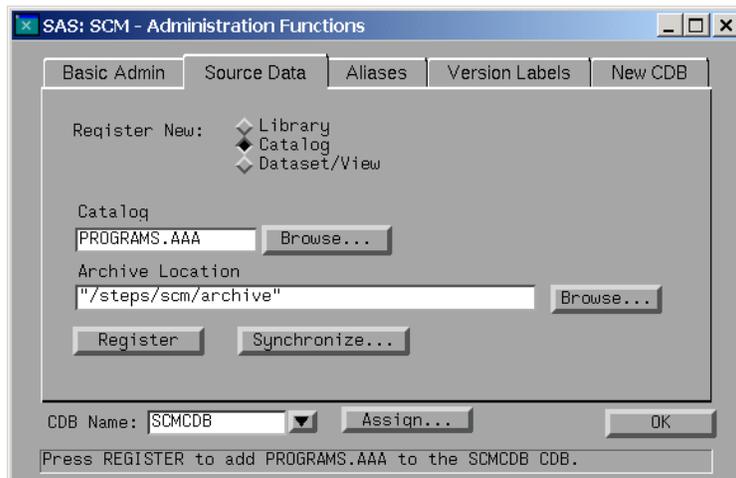


Figure 12

Click 'Synchronize...' to finish the operation, since you now want to 'synchronize' entries in an existing catalog. This is the equivalent of registering. You enter the 'Synchronize Source Files' screen. You arrive under the 'Registered but don't Exist' Tab (on the left). Click the 'Exists but no Registered' Tab on the right, to get the screen shown. The entries to be synchronized are highlighted as in the first figure. Click the 'Register' button towards the lower right. After registering, we see the second screen shown.

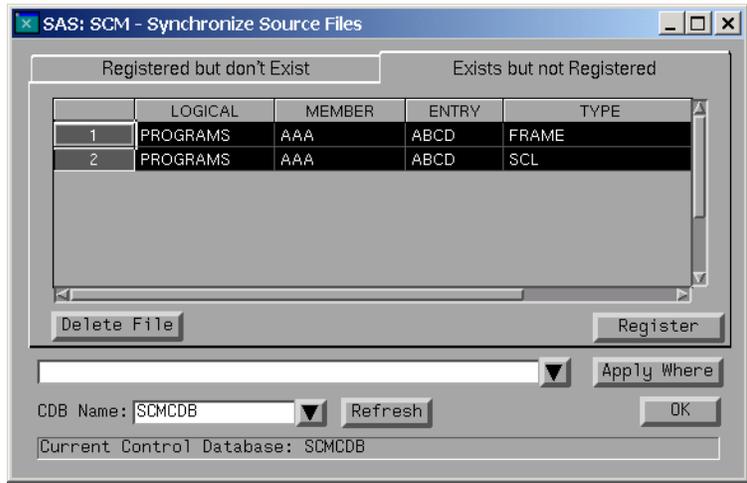


Figure 13a

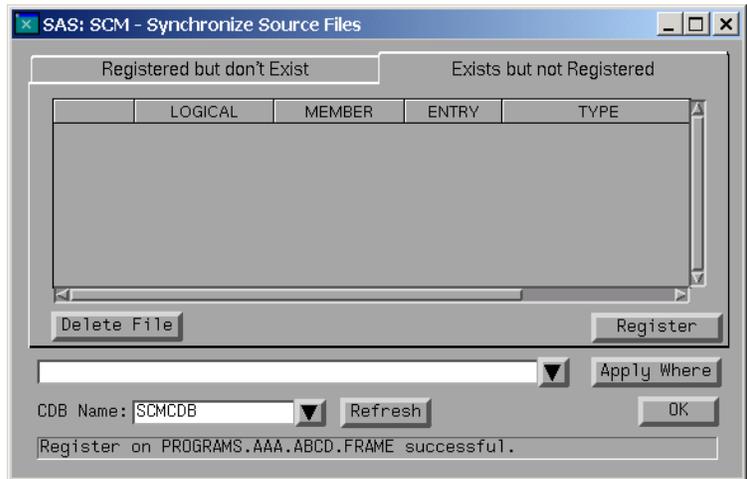


Figure 13b

After clicking 'OK' on the screen in Figure 13b, we are brought back to the Administrative Functions screen (Figure 12 above). When we get back to the Team Window, we can click View>Refresh to have the new entries in this existing catalog appear.

CONCLUSION

The SAS/AF development tool source control manager provides a means for preventing simultaneous edit access by multiple developers, while maintaining programs in a team environment. This facility also maintains previous versions of programs. In this paper, we have described installation of SCM, as well as file check out and check in, practices which can be

added to prevent unintended file overwrites, and creating and registering catalogs and entries. Other features not covered here include locking and unlocking files, and reverting to previous versions of a program. Details on these are available from the author, on request.

REFERENCES

SAS Institute Inc. (2001), *SAS System Help, Release 8.02*, Cary, NC: SAS Institute Inc.

Tasky, D., et al. (1999). "Get In Step With StEPS: Standard Economic Processing System," *Proceedings of the Twelfth Annual NorthEast SAS Users Group Conference*, 167-175.

ACKNOWLEDGMENTS

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