INTRODUCTION
The purpose of this paper is to present my experiences in training graduate students in the Food and Resource Economics Department at the University of Florida to use the SAS System for personal computers, release 6.04, as a tool in the Elements of Econometrics course. The goal of the course is to teach econometric problem solving techniques. The students use SAS software for the personal computer to perform all the analyses necessary to complete their assignments. The Food and Resource Economics Department at the University of Florida has more than eighty graduate students, 60% of which are international students and many of them coming from developing countries. Due to the fact that the computer backgrounds of the students are so varied, and that the size of the class is between twenty to thirty students, it was necessary to find a quick and efficient way to introduce them to personal computers, and especially to the SAS system, so that they could immediately start working on their assignments without having to worry about their lack of experience with SAS software.

THE STUDENTS
The students enrolled in the Elements of Econometrics course are, for the most part, first year graduate students in the Food and Resource Economics Department who already have an undergraduate degree in Agricultural Economics or a related field. There are, in addition, some graduate students from the Department of Economics. As undergraduates, the students have taken at least a one semester introductory statistics course, but they not necessarily have had previous experience with microcomputers. The fact that about 60% of the graduate students are international students add to the variety of levels in computer skills.

THE GOALS
This econometrics course is the first in a sequence of three. Its main goal is to train the students in econometric problem solving and in determining quantitative relationships among economic variables in agriculture and related industries. Another goal is to introduce the students to computer software to use as a tool for their analyses. This is a one semester course and, at the end of it, it is expected that they know how to choose the correct procedures to perform their analyses and that they can interpret the output of these procedures. SAS/STAT®, SAS/ETS®, the Computer Related Services Unit, and I help the students to accomplish this other goal.

THE RESOURCES
The Computer Related Services is a special unit within the Food and Resource Economics Department which is responsible for all of the department's computer needs. This includes software installation and maintenance, programming and consulting in statistics, econometrics, linear programming, matrix algebra software, as well as training of faculty, staff, and graduate students in the use of these packages.

The unit was created five years ago when the department underwent the transition from mainframe to personal computers. As every faculty member and most of the staff acquired their own personal computer, the department needed a support and training center. Our staff now includes 6 members. I was brought aboard for the purpose of supporting all of the statistics and econometrics software, especially SAS software.

Our facilities include a medium sized room with nine personal computers (five XT's, two 286's and two 386's), two laser printers, as well as manuals and appropriate documentation. Most graduate students count on the facilities of this
THE CHALLENGE

During the first year after the creation of our unit, the support that I gave was more or less on an individual basis. When a member of the department felt that it was time for her/him to experiment or take advantage of what the SAS system has to offer, they made an appointment with me at our convenience. We sat for a two hours hands-on session where I taught this person the basics of programming with the SAS system and the use of the display manager. This was very constructive. Not only did the person get individual attention, but also we had the opportunity to speed up or slow down the session according to the person's experience and skills. I learned that, soon after this session, the person could start doing her/his own programming and building up her knowledge of the SAS system more independently. However, the honeymoon did not last long.

Soon after this first year, when many faculty members felt more confident using their own personal computers and the SAS system, they started giving more of their assignments in the form of problems to be solved with the use of personal computer software. Prior to this, they had been using well-set mainframe routines that they passed along to their students. In the Elements of Econometrics course, all of the assignments were to be completed with the use of SAS software. As I mentioned before, this class usually has between twenty and thirty students with a very varied level of previous computer experience. This presented a challenge to my unit and to me. Our facilities were not prepared to handle this number of people as a group.

THE SOLUTION

In spite of my very positive experience in the unit with individual training, it was clear to me now that I could not continue training people in this way. Nevertheless, I wanted to give as much individual attention as possible to a class that could be accommodated in our facilities.

These students have to be trained in two areas: the use of the display manager and programming with the SAS system. DOS* training, for those who needed it, is offered by other members of the unit and by tutorials, prior to the SAS training sessions. In order to decide on the topics to be included in these training sessions, I sat in the class for a semester and had various discussions with the professor. Although this was a rather large investment of time at the beginning, it has paid off during the years that I have supported this class. Not only could I determine exactly the material that I needed for my sessions, but also it allowed me to prepare better for the continuous consulting support that I give during all of the semester.

To introduce them to programming with the SAS system, I offer a two hours seminar for the entire group. I also distribute a handout containing all of the material to be covered in the seminar and examples. I usually offer this seminar a short time before the first assignment is handed out.

In the first part of the seminar, I discuss the differences between the DATA and the PROC steps and go into details about the DATA step. This includes explaining to them what is a SAS data set, the "list" and "column" INPUT statement, how to handle alphanumeric characters and missing values, the INFILE and the LIBNAME statements.

I next go into the manipulation of data sets with SET and MERGE, the definition of new variables using the SAS functions, arithmetic and comparison operators, and the IF statement.

The second part of the seminar covers the PROC step. The first procedure to be considered is PROC PRINT. This is introduced as a method of printing and checking the data, and of determining whether the INPUT statement is working correctly.

Next, I discuss PROC MEANS and PROC CORR. PROC MEANS produces descriptive statistics such as means, standard deviations, corrected and uncorrected sum of squares of the variables. PROC CORR also produces descriptive statistics in addition to the correlation and covariance matrix and the corrected and uncorrected sum of
squares and cross products of the variables. All of these serve to help the students understand the derivation of the parameter estimates and the diagnostic and test statistics used in simple and multiple regression. These techniques are introduced during the first few weeks of the course.

Next, I cover PROC REG. One of the objectives of the course is to teach how to analyze economic data from a statistical point of view and how to find the best possible model that fits the data. Using PROC REG, the students experiment with different models and learn to determine possible problems and trends in the data. I especially emphasize the P and R options in the OUTPUT statement and the DW (Durbin Watson statistic) option. PROC AUTOREG is very much used during the second half of the course to teach the students about methods of estimation and tests of significance in the presence of autocorrelation. PROC PRINCOMP is used to study relationships among numerical variables and PROC GLM is used to study the use of dummy variables. Since the concepts necessary to understand these procedures are not introduced until the middle of the semester, I don't include these last three procedures in my seminar. They are discussed by the professor in class and I provide consulting support for them.

Finally, I teach the students how to use PROC PLOT in conjunction with data sets created in PROC REG for the study of patterns of residuals and predicted values in order to gain more insight into their analysis.

To present the use of the display manager, I divide the class into three or four small groups of eight or nine students each (each group is a session). I distribute a handout containing all of the material to be covered in the session. During each session, I explain the three windows concept, the use of the window keys, the function keys, and other miscellaneous keys. I also present the display manager commands, the program editor line commands, and the file management commands. I use examples of SAS programs to illustrate each of these. I run and rerun several programs so the students can see what happens in the windows when this is done. Afterwards, I give some exercises and encourage them to work through them at the keyboard.

After the seminar and the hands-on session, the students work on their assignment in our facilities. The professor includes, together with the assignment, a handout with a "draft" program that contains hints about the statements necessary to complete their analyses. After attending the seminar and the hands-on session, the students are expected to know how to "customize" this draft program for their assignment and to work relatively independently using the display manager. The professor includes a "draft" program with every homework but, as the course progresses, it contains a decreasing amount of hints and details.

During the semester, I am available for several hours every week to answer questions related to the implementation of their assignment using the SAS system.

THE RESULTS

In general, the professor, my unit and I have had positive results using this method of SAS training on PCs in this course. We think that the method has an adequate combination of group instruction and individual attention. The students have indicated at all times that they felt properly supported by the personnel in our facilities. We have also found, further on, that when these students have to use the SAS system in a more intense way such as working in the analyses for their theses or dissertations, they are able to pick up very quickly from where the class had ended. We consider this to be a success given the varied computer background of the students at the beginning of the course.

The students' comments about this method go in two directions. Some students have indicated that they would like to have the seminar earlier in the course. This way they can concentrate better in learning to program with the SAS system without the pressure of an assignment over them. Others have pointed out that they would like the seminar later on in the course. This way
they are more familiar with the concepts of regression and can understand better that part of the seminar. These two viewpoints seem to indicate the need for an adjustment in the timing of the presentation of the different procedures. Instead of giving a two hour seminar before the first assignment is handed out, we will consider experimenting with two one hour seminars: one at the beginning of the semester to present the DATA step and the descriptive statistics procedures, and another around the middle of the semester to present PROC REG and PROC AUTOREG. The students have also indicated that they want DO loops covered in the seminar.

In addition, I plan to incorporate more information about file management in the hands-on sessions to help the students keep their programs and data files in an organized way.

To summarize, the design of this training program has proven to be both efficient and flexible. Designing and working in it have been a very rewarding experience for me.

REFERENCES

NOTE: SAS software, SAS/STAT and SAS/ETS are registered trademarks of SAS Institute Inc., Cary, NC, USA.
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Contact:
Mercedes C. Rosalsky
G120 MCC
Food and Resource Economics Dept.
University of Florida
Gainesville, FL 32611
Tel. (904) 392-9900