

PACE2000 – STAND ALONE SOFTWARE PACKAGE AND ADD-IN FOR
MICROSOFT EXCEL DESIGNED FOR TEACHING STATISTICS AT THE
INTRODUCTORY-INTERMEDIATE LEVEL

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PACE2000 is software that has been developed with the aim of assisting the teaching of introductory-intermediate statistics at the tertiary level, in particular, the teaching of statistics for business and economics. It was developed primarily to provide a software package that has substantial spreadsheet capabilities, as well as widely used statistical graphic and calculation routines not available in commercial spreadsheet packages. Key aims of the authors included producing a product that was powerful enough for modern statistical teaching, that was easy and enjoyable for instructors and students to use, and was affordable. It is available as a stand-alone version or as a Microsoft Excel Add-In. A principal strength of the software is its speed for modelling and for exploring data. The author of this paper is coauthor of the software.

INTRODUCTION

In Australia, and probably in most other countries, the trend is for students graduating from high school to have extensive skills in word processing and spreadsheet software, in particular, Microsoft Word and Microsoft Excel. By means of such powerful software, students are able to produce sophisticated reports incorporating calculations, graphs and charts.

At university, Excel (or an equivalent spreadsheet package) has become a compulsory component of many subjects and courses. This is particularly so in faculties and schools of business, commerce and economics.

As a result of these trends, some lecturers in statistics feel obliged, or are strongly encouraged, to follow suit, and use spreadsheet packages for teaching statistics, abandoning dedicated statistics packages such as SPSS or Minitab. The power and versatility of spreadsheet packages, and their relevance to, and widespread use in, education and in the workplace cannot be ignored. However, when it comes to using commercially available spreadsheets for teaching statistics, there are significant deficiencies. In particular, commercial spreadsheets are not designed for teaching statistics, nor for statistical research, and a great deal of effort and time may be required by students to generate useful statistical output. Further, dedicated statistics packages, such as SPSS and Minitab, are considered by some instructors to be too dedicated to statistical analysis, and not user-friendly enough for beginning statistics students. A

possible consequence is that courses are modified or scaled back to meet software deficiencies.

The authors of PACE2000 have tried to overcome some of the deficiencies of spreadsheet packages and dedicated statistics packages.

OBJECTIVES OF THE SOFTWARE

Some of the key aims of the authors in developing PACE2000 were as follows:

- To develop Windows based software that both students and instructors in introductory-intermediate statistics would find easy, and intuitive, to use.
- To incorporate the best features of well-known commercial spreadsheet packages and well-known statistics packages.
- To incorporate routines and output similar to textbook coverage.
- To extend the topics that can be treated in standard courses.

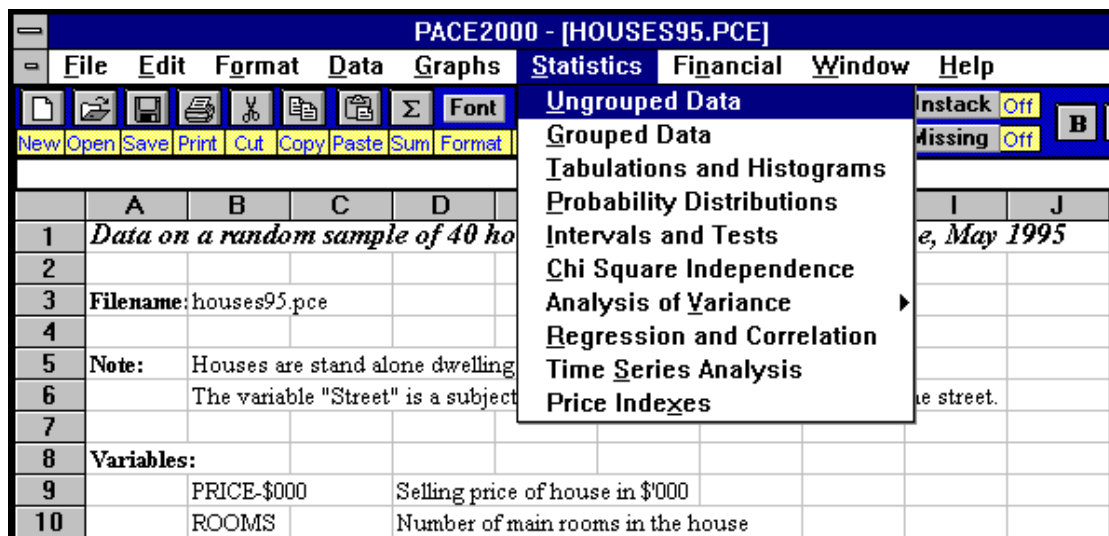


Exhibit 1: Stand-alone version illustrating the spreadsheet, menu and statistics options

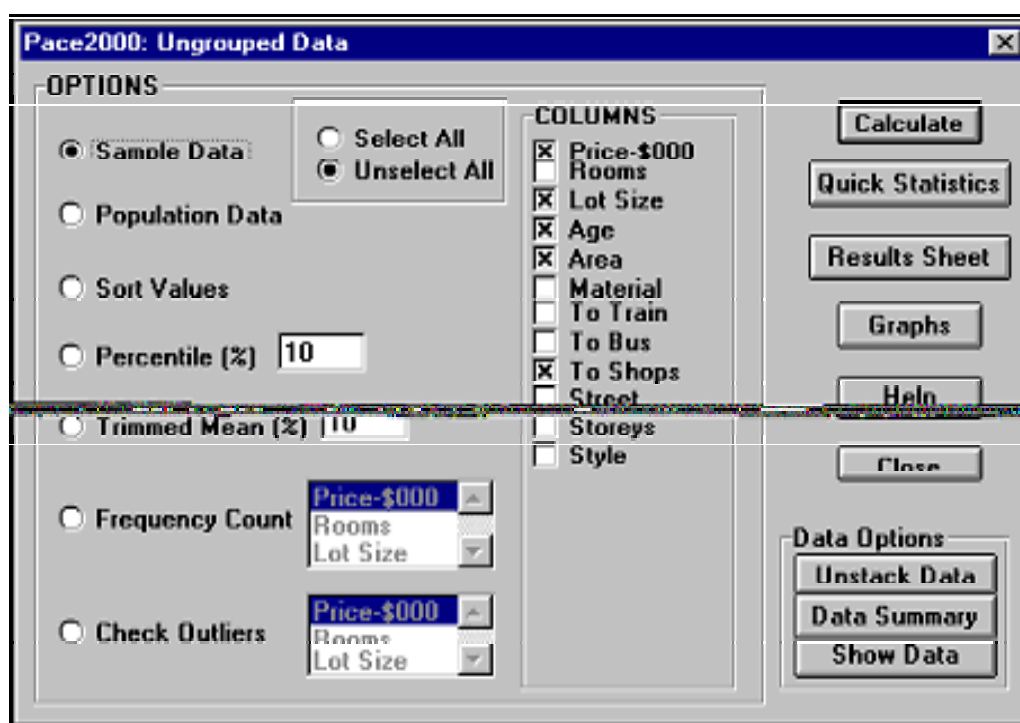
- To incorporate calculation and graphs routines not covered by commercial spreadsheets.
- To produce a product priced at less than the cost of a standard textbook, and hopefully in the price range of students.
- To make statistics a far more interesting, relevant and enjoyable subject.

WHAT IS PACE2000?

PACE2000 is specifically designed for teaching statistics. It is available in two forms: as a stand-alone Windows spreadsheet package or as an Excel Add-in (for Excel 5 or later). Version 2.0 is the current published version, while the Excel Add-in (under development at time of writing this paper) emulates the Version 2.0 capabilities.

In either its stand-alone version or as an Excel Add-in, PACE2000 offers extensive spreadsheet facilities, specialised statistical calculation routines and specialised graphics options. The methods used in PACE2000 for handling data sets mean that modelling and data exploration are quick and simple.

Exhibit 2: PACE2000 illustrating a typical dialogue box



In its stand-alone version, key functions and capabilities of PACE2000 are:

- *Standard Windows operation:* Using menus, tool bars and dialogue boxes.
- *Self-contained spreadsheet:* With formulae, inbuilt functions, drag and drop, etc.
- *Data manipulation:* Including sorting, and the ability to unstack data and to select only restricted observations for analysis. Unstack breaks one variable into groups according to another index variable. Select enables only certain rows from the Data Area to be included in an analysis.

- *Graphs*: Include standard graphs such as bar, pie, line and scatter graphs, as well as boxplots, dotplots, histograms, stem-and-leaf, probability plots and time series charts.
- *Statistics routines*: Cover most of the topics in standard textbooks for introductory-intermediate courses in statistics. Included are ungrouped and grouped data, frequency distributions and cross-tabulations, probability calculations, confidence intervals and hypothesis tests, regression and correlation, and time series analysis.
- *Data Area*: In PACE2000, before most statistical routines can be utilised or any type of graph generated, a set of data must be highlighted (or selected), then set as a *Data Area* (of one or more columns/variables, and two or more rows/cases, of numerical data). Column Headers identify variables in the statistics and graph routines, and then it is simply a matter of clicking on which variables are to be used.

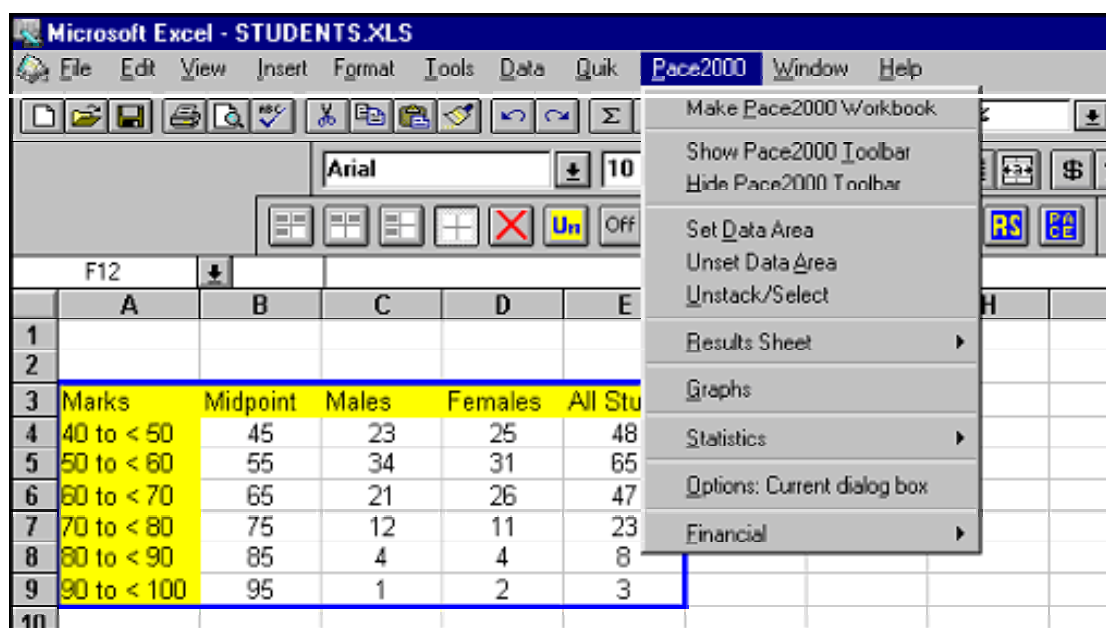


Exhibit 3: As an Excel Add-In, illustrating the PACE200 option in the main Excel menu, the PACE2000 toolbar and main options, and a small Data Area

- *Results Sheet*: All statistical output is accumulated automatically in a special Results Sheet, which is a spreadsheet in its own right. Thus formulae can be entered, labels changed and data moved around. Results of other statistical calculations can be set as a Data Area for further analysis. Cut/Copy and Paste can be used to save the

important calculations somewhere more suitable, including in a word processing document.

- *File handling:* Files are compatible with other spreadsheets via Excel 4 files, however, cutting and pasting is normally all that is required. A range of ASCII formatted or delimited files can be imported for analysis.
- *Help system:* Includes extensive textbook-like explanations with descriptions of topics, definitions, formulae and coloured diagrams.
- *Textbook cross-reference:* A secondary Help system cross-referencing PACE2000 options and routines against Chapters and Sections in selected textbooks.

As an Excel Add-in, PACE2000's capacities and operations are:

- *PACE2000 is added to the Excel menu:* Clicking on this menu item opens up the full PACE2000 system, (statistics and graphs routines, data handling and Help).
- *Full Excel capabilities:* In addition to PACE2000 options, the user has access to the full capabilities of Excel (all its inbuilt functions, wizards, graphs options, etc.).

TEACHING AND LEARNING BENEFITS

PACE2000 has several distinct education advantages.

- As a fully functional spreadsheet in the style of Excel or Lotus 1-2-3, many students find it familiar, and easy to learn and use. The computing skills required are not demanding.
- Students enhance their spreadsheet skills, learning to use a spreadsheet as a powerful calculating and exploratory device in its own right.
- Dialogue boxes for speciality routines are designed to be clear about what input is required, and what calculations will be produced. Main routines match typical textbook chapters and topics.
- Input of information, and output to the Results Sheet, is written in "textbook" language so that students can easily match the input and output with their textbook and lecture notes.
- Once a Data Area has been set, the student can move in and out of various calculation or graphics routines, analysing the same set of data using different techniques, for

example, applying ungrouped data, plotting boxplots, generating frequency distributions, or doing a test for the difference between two means.

- Key graphs for describing and exploring data, namely, box plots, dot plots, stem-and-leaf, histograms, probability plots and plots for hypothesis tests, tie in with textbook teaching.
- Speed for exploring data and modelling is possible via simple clicks and key strokes.
- Students can generate reports and assignments by incorporating results into documents.
- It has the basic data handling capabilities of good statistics packages, so that subsets of data, either by variable, record, or unstacking, can be easily analysed. The Unstack and Select options in most routines greatly increase the power and speed of analysis.
- PACE2000 prepares students for other software, by teaching them spreadsheet skills for using the well-known spreadsheet packages, and also preparing them for using the data handling capabilities and power of well-known statistics packages.
- The routines and options are limited to approximately all that are required for an introductory-intermediate course, so that students are not intimidated by a wide range of meaningless, though otherwise powerful and useful options.
- As standard Windows software, PACE2000 can be easily transported to the workplace.
- It is suitable for demonstrating statistical concepts in small and large classes.

No in-depth analysis has been conducted regarding the suitability of PACE2000 for teaching introductory-intermediate statistics for business and economics. However, it seems to offer good “value for time” in terms of teaching and learning. Thus, instructors are not bogged down in helping students with the software, while students learn the package quickly, and can quickly generate meaningful results for study or assignment purposes. Students can concentrate on studying statistics, with little time wasted on learning and coping with difficult software.

A disadvantage of the stand-alone version is that instructors are hesitant to start students on another package, and would prefer to use software, such as Excel, that is used elsewhere in a particular degree program.

CONCLUSION

The PACE2000 'motto' is "Enjoy Statistics!".

REFERENCES

Boyle, R.G. and Sarjeant, H. B. (1997). *PACE2000: Statistics Software and Spreadsheet for Windows*, Version 2.0. ISBN 0-646-30823-8, Cicada Bay Pty Ltd.