微型计算机软件IBM 3.0版

国外大学优秀教材——工业工程系列（影印版）

J. Wesley Barnes

工程师和科学家实用统计分析（用户手册）
——基于计算机的方法

User's Manual to Accompany
**Statistical Analysis
for Engineers
and Scientists**
A COMPUTER-BASED APPROACH
Microcomputer Software
IBM Version 3.0
J. Wesley Barnes

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（第四版）
——电子计算机的方法
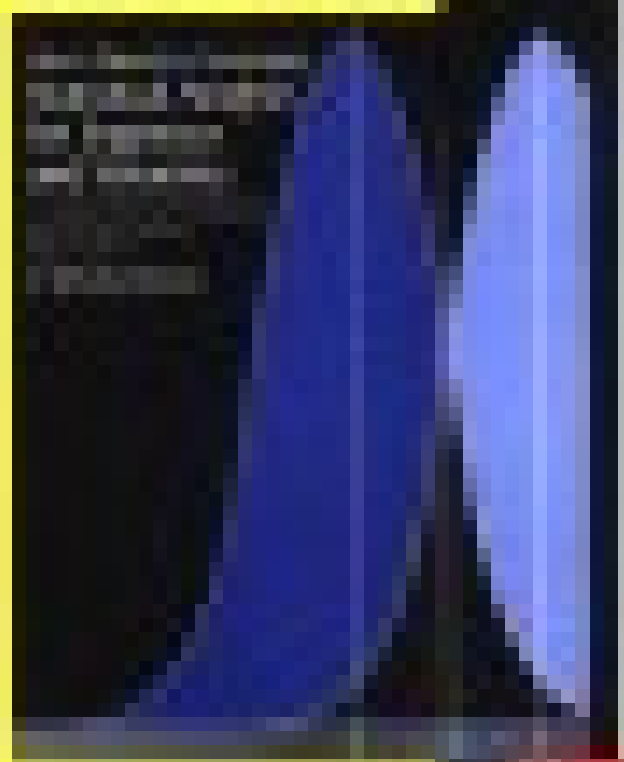
User's Manual to Accompany Statistical Analysis for Engineers and Scientists

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MICROCOMPUTER SOFTWARE IBM VERSION 3.0

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用户手册

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PREFACE

This *User's Manual* is designed to help you use the software that is contained in this package to the fullest advantage. It is my sincere hope that you will find this software and the text, *Statistical Analysis for Engineers and Scientists: A Computer-Based Approach,* a powerful pair of tools both for performing statistical analysis and for illustrating and teaching the concepts that underlie the correct and proper use of statistical tools.

Because of the great many suggestions and helpful comments from users over the past several years, the current version of the software, Version 3.0, is more polished and possesses additional capabilities when compared to its predecessors. Among these new capabilities are a full-screen data editor and the distribution evaluator programs for six continuous distributions, the gamma, beta, exponential, Weibull, uniform, and lognormal distributions, which were not present in earlier versions. In spite of the expanded capabilites, users of earlier versions will find that the current software maintains its very user-friendly character and powerful analysis capabilities. I want once again to express my thanks to my friend and colleague, Dr. Manuel Laguna, for his help with the earlier versions of the software.

This software is not copy-protected. The first thing you should do is to make a copy of the software. Put away the original software in a safe place, and use the copy. A collection of instructor-oriented programs is available from the author. Among other things, the instructor-oriented programs enable a teacher to generate data sets for additional exercises very easily for various applications throughout the text.

J. Wesley Barnes

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I.
INTRODUCTION

The Statistical Analysis for Engineers (SAE) Computer Software, IBM Version 3.0 (1994), is provided to you on a 720K 3.5 inch disk in compressed form. The software is not copy protected. It is strongly suggested that you make a copy of your disk, place the original in a safe place, and use the copy. If the disk is not compatible with your computer, contact your McGraw-Hill representative, or contact the author directly:

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Getting Started

The best and easiest way to use the software is to install it in one directory on the hard disk on your computer. The provided disk contains five files: D1.EXE, D2.EXE, D3.EXE, DPDFTRQB.BAS, and PCPQBSC.BAS. Installing the programs on a hard disk is very easy. First you create a directory on the hard disk, i.e., at the "hard disk prompt" (such as C>), type MD *name,* and then type CD *name* to change to that directory. For purposes of illustration, assume that your new directory is named STAT. After you have successfully created and changed to STAT (by typing MD STAT and CD STAT), place the SAE disk in the external "floppy" drive A and change to drive A by typing A:. Now type D1.EXE C:\STAT. This will copy all the files from the compressed "disk1." When the disk1 files are copied, type D2.EXE C:\STAT, and when the files from disk2 are copied, type D3.EXE C:\STAT. Finally, type COPY *.BAS C:\STAT to copy the remaining two files to STAT. After the files are copied, the software is installed in your hard disk, and you can use it by changing back to your new *name* directory on drive C and then typing START.

You may also choose to implement one of two other options:

1. You may copy the software to a high-density 1.44 megabyte 3.5 inch floppy disk. This requires at least one high-density drive and is accomplished by placing your SAE disk in drive A and changing to drive A. Next, type (in sequence) D1.EXE B:\, D2.EXE B:\, and

D3.EXE B:\, and follow the instructions on the screen. (Your 1.44 megabyte floppy is the disk for drive B.) You will probably want to copy the QBASIC files DPDFTRQB.BAS and PCPQBSC.BAS to another disk for possible later use. After the files are copied, the software is installed on your high-density disk, and you can use it by typing START from the prompt for its drive. (With only one drive, this process will require many changes of the two disks. Two drives are preferable.)

2. You may copy the software to three 720K floppy disks. This is accomplished by placing the SAE disk into your external floppy drive A and changing to drive A. Next, type D1.EXE B:\ and follow the instructions on the screen. (Each of your three 720K floppies will be the disk for drive B for each of the EXE files.) When the copying process for D1.EXE is completed, place the SAE disk into the drive and type D2.EXE B:\. When the copying process is completed, place the SAE disk into the drive and type D3.EXE B:\. The process is completed by placing the SAE disk in drive A and typing COPY *.BAS B:\. This will place the remaining two files on your third floppy disk. After the files are copied, the software is installed on your three disks, and you can use it by placing the first disk in the active drive and typing START.

In using the Statistical Analysis for Engineers Computer Software, IBM DOS 3.1 or a later version (of higher number) must be available to it. (This can be ensured most easily by placing your DOS directory on your DOS *path* statement). At the very least, the software must be able to access the following DOS files: COMMAND.COM, BASICA.COM, GRAPHICS.COM, and FORMAT.COM.

If you have an IBM-compatible machine, BASICA.COM might not be present. However, you should have available another BASIC file such as GWBASIC.COM or GWBASIC.EXE. If this is true in your case, *first* copy the BASIC file to your SAE software directory and *then* rename the BASIC file as BASICA.COM; e.g., use the DOS *rename* command, typing

REN GWBASIC.COM BASICA.COM

BASICA.COM is needed for using the two programs in your software package that require the user to input a mathematical function from the keyboard in the correct syntax for the BASIC computer language. These two programs are accessed by options F5 and F7 on Menu 1.0, as explained below. If your machine uses Microsoft's DOS 5.0 or higher, you will have to use the two special QBASIC programs that have been especially provided

for your use. The directions for how to use the QBASIC programs are given in the sections of this User's Manual that present those two programs.

After you type START, the following screen will appear:

```
                          Welcome to

      STATISTICAL ANALYSIS FOR ENGINEERS COMPUTER SOFTWARE
                        IBM Version 3.0

                        a supplement to

              Statistical Analysis for Engineers andScientists
                    A Computer-Based Approach

                              by
                        J. Wesley Barnes

              Copyright 1994 by McGraw-Hill, Inc.
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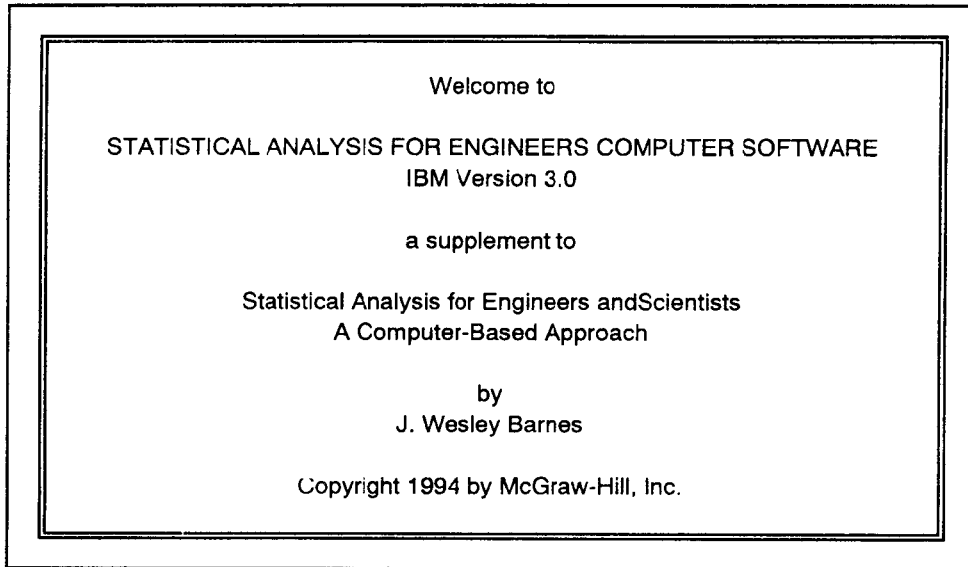
After you press ↵ , the screen shows the following:

DISK PARAMETERS	
DISK	**DRIVE**
Program Disk 1	C:
Program Disk 2	C:
Program Disk 3	C:

Press ↵ to Continue or Space Bar to Change Parameters

At this point you can adjust the parameters to your convenience. If you want to do so, press the space bar and follow the directions on the screen to

change the parameters. If you answer by pressing ↵ , the values of the parameters will remain unchanged. The following values are recommended:

Computer Configuration	Disk	Parameter
One or Two drives	1	A:
	2	B:
	3	B:
Hard disk (installed programs)	1	C:
	2	C:
	3	C:

The drive designation *C:* for the hard drive is for explanation only. You may use any single-letter designation from *C* through *Z* to designate your system's hard drive.

An Overview of the Software Menus

The software is organized into a Main Menu made up of four menu screens: Menu 1.0, Menu 2.0, Menu 3.0, and Menu 4.0. Menu 1.0 appears after you finish adjusting the program disk parameters. The other menus can be reached by pressing ← or → one or more times. When you find the program you want to access, select it by pressing the corresponding Function key (F1 through F10). After selecting a program to run, you will see a greeting screen and then an initial menu for the program. This initial menu shows the features of the selected program and gives you the alternative of going back to the Main Menu.

When a menu is displayed, the only active keys are the Function keys and the Shift-Function keys. To select programs under the Shift-Function keys, hold the Shift key down and press the desired function key (F1 through F10). Even though the programs appear to be independent of each other, we suggest that you *do not* run them without using the main menu. They will often function incorrectly because of the absence of information provided by the other programs.

To quit using the software, go to Menu 1.0 and select F10. Always save your work *before* leaving any program, i.e., before selecting Return to main menu, or your work may be irretrievably lost.

Menu 1.0 through Menu 4.0 are presented on pages 6 and 7.

Some Comments on Graphics, Data File Extensions, and Error Trapping

All the plots presented by this software are designed to appear on a color monitor in medium resolution. Therefore, an IBM Color/Graphics Monitor Adapter (CGA) or equivalent (e.g., Hercules Color Card) is required even when using a monochrome display. There are some freeware programs that allow some non-CGA displays to be used with this software. If you need this capability, please contact the author directly. Whenever space allows, textual information associated with the plot appears on the same screen with the plot. Otherwise, the associated information is presented on the previous or following screen. Any plot can be printed by pressing Shift–Print Screen on your keyboard. (This assumes that your printer driver has been configured to accept this keyboard command.)

On some systems one additional thing is necessary for dumping a graphics screen to a printer successfully. If pressing Shift–Print Screen causes only the text to be printed, return to the system level by selecting F10 from Menu 1.0. Next, type GRAPHICS and then type START to invoke the SAE software once more.

Data files are identified by their extension (*filename.extension*). When you are saving or reading a file, *do not* add the extension name if the computer is to add it automatically. When no message from the computer is given about the extension name, enter the full name, including the extension. When you ask to see the catalog of files, only the files with the correct extension for the current application will be listed. This means that a *File not Found* error can occur if no file is found with the expected extension. A complete list of extension names is given in Appendix C.

All the programs contain error-trapping routines. The most common errors are handled directly, and the execution of the program resumes at the point in the program where you can correct the error and continue. Occasionally an error may not be identified and the message "error #2 has occurred" is displayed. In this case consult Appendix A of your BASIC manual. If you think that the error is due to a programming problem contained in the software, please contact the author directly. If the error-trapping routine is unable to recover and resume execution in the program, execution is resumed at the most immediate menu.

If the program stops and there is no response to your keyboard input, the program has crashed. In spite of the great amount of effort expended in polishing the programs and developing extensive error-trapping procedures, you may encounter something that has not been provided for in these efforts. If you believe that the fault is in the program and not in your computer or in the input you gave to the program, please contact the author and describe the problem so that it can be corrected in later versions of the software package. To continue after a crash, turn your computer off and then on, or reset the system.

MENU 1.0

F1	Simulate User's Discrete Distribution
F2	Evaluate Factorials, Permutations, and Combinations
F3	Distribution Evaluators
F4	Plot Probability Distribution Functions of Table 3.2 & 4.1
F5	Plot User's Continuous Distribution or Functions
F6	Plot User's Discrete Probability Distribution Functions
F7	Transform Discrete Probability Distribution Functions
F8	Convolve User's Discrete Probability Distribution Functions
F9	Utilities
F10	Quit

MENU 2.0

F1	Basic Analysis of a User Provided Data Set
F2	Simulation of Probability Distributions of Table 3.2 & 4.1
F3	Confidence Intervals about Means, Variances, & Proportions
F4	Hypothesis Tests about Means, Variances, and Proportions
F5	O.C. Curves for Hypothesis Tests about Means
F6	O.C. Curves for Hypothesis Tests about 1 Variance
F7	O.C. Curves for Hypothesis Tests about 2 Variances
F8	O.C. Curves for Hypothesis Tests about 1 Proportion
F9	The Beta Error for Hypothesis Tests about 2 Proportions
F10	Bivariate Regression Analysis

	MENU 3.0
F1	Multivariate Regression Analysis
F2	Transformation of Regression Data
F3	One Factor Completely Randomized Analysis of Variance
F4	Two Factor Blocked Analysis of Variance
F5	Two Factor Factorial Analysis of Variance
F6	Three Factor Factorial Analysis of Variance
F7	O.C. Curves for Analysis of Variance
F8	The $\bar{X}$ - R Chart
F9	The p Chart
F10	O.C. Curves for Single Sampling Plan

	MENU 4.0
F1	Chi-Square Goodness of Fit Test
F2	Wilcoxon Signed Rank Test
F3	Wilcoxon Rank Sum Test
F4	Kruskal - Wallis Test
F5	Full Screen Data Editor

Hardware and Software Requirements

Software required: IBM DOS 3.1 or equivalent for an IBM-compatible machine; the BASIC version included on the DOS disk should support all graphics statements, e.g., BASICA or GWBASIC 3.2

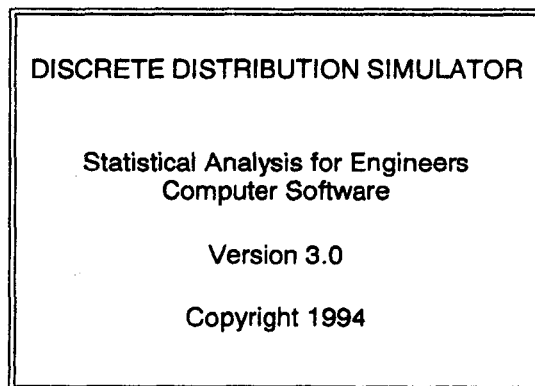Software included: 1 Program Disk

Hardware required: IBM 40/80 column display

IBM PC, PCXT, AT, or compatible equivalent with at least 512KB memory available for applications

One 720K-megabyte diskette drive

IBM Color/Graphics Monitor Adapter (CGA) or equivalent (e.g., Hercules Color Card)

II.
SIMULATION OF A FINITE DISCRETE SAMPLE SPACE

This program performs the simulation of any finite discrete sample space. Its primary use is in illustrating the concept of statistical variability and the frequency interpretation of probability.

Here and throughout the rest of the manual your response will be underlined; i.e., a yes response will appear as Y. In the following material it will be understood that all user responses are terminated by pressing ↵ .

Selecting option F1 from MENU 1.0 causes the following title page to appear:

```
DISCRETE DISTRIBUTION SIMULATOR


   Statistical Analysis for Engineers
       Computer Software

          Version 3.0

        Copyright 1994
```

The screen will clear after you press ↵ , and the following will be displayed:

> This program simulates a repeatable experiment
> associated with a finite discrete sample space
> for a specified number of trials.
> Each outcome is labeled and has a stated
> probability of occurrence.

The screen clears again and then displays the following:

	MENU

F1	Information on use of Program
F2	Run Program
F3	Return to Main Menu

The first time you use the program, you should probably select F1. After the instructions are concluded, the menu for this program reappears.

Selecting option F2 causes the program to begin its actual execution. The first thing that is required is the probability distribution function (pdf) to be simulated.

	SELECT

F1	Create a new PDF from keyboard
F2	Read existing PDF from Disk File

If you have previously created a pdf with this program, you could select option F2. However, most of the time option F1 will be selected, at least by new users. After option F1 is entered, the screen asks the following:

1) Please enter the number of possible outcomes (<= 100)

in your experiment ? <u>6</u>

2) Please enter the Label and the Probability for each outcome

press ⮐ after each outcome entry

The outcome labels can be any set of letters or numbers. In this example, 1 through 6 are convenient labels.

LABEL	PROBABILITY
?<u>1</u>	?<u>.16666</u>
?<u>2</u>	?<u>.16666</u>
?<u>3</u>	?<u>.16666</u>
?<u>4</u>	?<u>.16666</u>
?<u>5</u>	?<u>.16666</u>
?<u>6</u>	?<u>.16666</u>

The finite sample space to be simulated is

OUTCOME	PROBABILITY
1	.16666
2	.16666
3	.16666
4	.16666
5	.16666
6	.16666

Do you want to save this data set on a disk file (Y,N) ? <u>Y</u>

Here you have an opportunity to save your probability distribution for later use.

1) Enter the drive data is to be saved on (A,B,C) ? <u>C</u>

The extension .PDF is added to the name of the file automatically.

2) Enter the NAME of the file to be saved

or enter ? for a CATALOG of the Disk   ? <u>IDICE</u>