PROCEDURE TABLES: A Two-way Table Generator With Statistics For Control Verses Treated Comparisons

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ABSTRACT

PROCEDURE TABLES produces a two-way, treatment by parameters, table containing various statistics (mean, standard deviation, number of observations, standard error, t-statistic, variance, etc.) and compares multiple treatments to a common control group. Statistical testing can be computed using either a Student, Dunnett, Williams, or Bonferroni t. Variance homogeneity is tested using a procedure of Bartlett ($P \leq .001$). Raw or ranked data can be analyzed.

KEYWORDS

One-way ANOVA, Two-way tables, Multiple comparisons, Student t, Dunnett t, Williams t, Bonferroni t, Nonparametric t tests, SAS PROC TABLES

INTRODUCTION

Quite often one desires a two-way table with treatment groups indexed vertically and response parameters horizonally. In each cell of such a two-way table, various statistics, mean, standard deviation, etc., should be given vertically. It is also desirable to be able to test each treated group against a common control group. PROC TABLES accomplishes all of the above.

The various statistics available in each cell are as follows: by default - mean, standard deviation and number of observations and by request - sum, standard error of mean, number of missing values, minimum, maximum, range, variance, corrected sum of squares, uncorrected sum of squares, and a t-statistic.

Each group can be compared to a common control group by any of the following techniques: Student, Dunnett, Williams or Bonferroni t. One or two-tailed testing can be requested and the level of the test can be specified: .05 or .01 for Dunnett or Williams; .05 to .000001 for Student or Bonferroni.

The tabulated statistics and statistical testing can be computed on either the raw data - parametric testing, or on the ranked data - nonparametric testing.

Additionally Bartlett's test for homogeneity is applied to the variance of each group. Statistical testing is impaired only if $P \leq .001$, therefore significance is declared at this point.

TABLE CONSTRUCTION

PROC TABLES constructs two-way tables; a CLASSES variable defines vertical margin, and the response variables are given horizontally. In each cell of the table any of a number of statistics can be specified; these statistics will be printed vertically. The various statistics are given in the PROCEDURE TABLES section. The BY feature allows multiple tables. In many cases, the table construction capabilities of TABLES will be a sufficient and attractive summarization of experimental results so that special programming will be unnecessary.

STATISTICAL TESTING

Table 1 summarizes the error rate considerations and dose response characteristics of four types of control verses treatment statistical tests.

Table 1 PROC TABLES Statistics Options

Type of Statistics	Error Rate	Dose Response
Student	Per Comparison	No Requirement
Dunnett	Per Parameter	Treatments Unrelated
Williams	Per Parameter	Monotone Increasing or Decreasing
Bonferroni	True Experiment-Wise (upper bound)	No Requirement

The Student t is classically used to test whether two sample means are sufficiently different as to be considered not to have come from a single population. The variability is measured in each sample as the sample variance and pooled. Technically, the test requires that the observations in each population be normally and independently distributed and that the samples be drawn from populations with equal variance. Practically, the test is rather robust to departures from normality and equality of variance.

The Dunnett t is designed to test multiple treatments against a common control. The error

INDEX # 8

NAME: MACRO HIST

DESCRIPTION: PROVIDES FOR VERT. & HOR. HISTOGRAMS WITH SINGLE AXIS LABELING AND TITLE INFORMATION. USES PUT STATEMENTS TO FORMAT THE GRAPHS. FREQUENCIES ARE ALSO PLOTTED.

REQUIREMENTS: 1K

REFERENCE:

CONTACT & : THARP, M. L. STRAND, R. H. ENVIRONMENTAL SCI. DIV.
ADDRESS: P.O.BOX X, BLDG. 1505, ORNL OAK RIDGE TN 37830

INDEX # 9

NAME: PROC DISPLA1

DESCRIPTION: PLOTS 2-DIMENSIONAL DATA USING SAS ON A CALCOMP PLOTTER. LINEAR OR LOG. SCALES, UP TO 500 PTS., AXES LABELS, TITLING, AND UP TO LINES PER GRAPH ARE AVAILABLE.

REQUIREMENTS: DISSPLA SOFTWARE & CALCOMP PLOTTER 4K

REFERENCE: ORNL/TM-6993, OAK RIDGE NATIONAL LABORATORY. (CONTACT AUTH

CONTACT & : OLSON, R. J. ENVIRONMENTAL SCI. DIV.
ADDRESS: P.O.BOX X, BLDG. 1505, ORNL OAK RIDGE TN 37830

INDEX # 10

NAME: PROC WILCOX

DESCRIPTION: DISTRIBUTION-FREE ESTIMATES OF THE RATIO OF TWO RANDOM VARIABLES. CONFIDENCE INTERVALS ARE ALSO ESTIMATED. PRODUCES WILCOXON T-STATISTIC FOR PAIRED SAMPLES.

REQUIREMENTS: 4K

REFERENCE:

CONTACT & : KUMAR, DEVA ENVIRONMENTAL SCI. DIV.
ADDRESS: P.O.BOX X, BLDG. 1505, ORNL OAK RIDGE TN 37830

INDEX # 11

NAME: FUNCTION GETBIT

DESCRIPTION: ALLOWS USERS TO RETREIVE ANY BIT STRING SUBSET OF A SAS VARIABLE

REQUIREMENTS: 4 K

REFERENCE:

CONTACT & : HARRELL, FRANK BICSTATISTICS DEPT.
ADDRESS: UNIVERSITY NORTH CAROLINA CHAPEL HILL NC 27514

INDEX # 12 | NAME: MACRO RECODE

DESCRIPTION: RECODES A SPECIFIED VALUE OF INDICATED VARIABLES ON ALL OBSERVATIONS ON A SAS DATA SET TO A SECOND SPECIFIED VALUE (12 CARD IMAGES)

REQUIREMENTS:

REFERENCE:

CONTACT & ADDRESS: HENDERSON, DON
DATA SYSTEMS APPLICATION DIV.
ARS, NATIONAL AGRIC. LIB. BLDG.
BELTSVILLE MD 20705

INDEX # 13 | NAME: MACRO KS1SAMP

DESCRIPTION: KOLMOGOROV-SMIRNOV ONE SAMPLE TEST. OUTPUTS SAMPLE SIZE TEST STATISTIC DSUP, AND, WHEN N GE 30, SELECTED ASYMPTOTIC CRITICAL VALUES FOR DETERMINING P-VALUE

REQUIREMENTS:

REFERENCE: SUGI 77 PROCEEDINGS & UPDATE FROM AUTHOR

CONTACT & ADDRESS: GJERTSEN, W. R.
SAS INSTITUTE, INC.
P.C. BOX 8000
CARY NC 27511

INDEX # 14 | NAME: MACRO KS2SAMP

DESCRIPTION: KOLMOGOROV-SMIRNOV TWO SAMPLE TEST. OUTPUTS SAMPLE SIZES N1 AND N2, TEST STATISTIC DSUP, AND, WHEN N1 AND N2 GE 30, SELECTED ASYMPTOTIC CRITICAL VALUES FOR DETERMINING P-VALUE.

REQUIREMENTS:

REFERENCE: SUGI 77 PROCEEDINGS & UPDATE FROM AUTHOR

CONTACT & ADDRESS: GJERTSEN, W. R. HARRELL, F. E.
SAS INSTITUTE, INC.
P.C. BOX 8000
CARY NC 27511

INDEX # 15 | NAME: MACRO LSEXP

DESCRIPTION: FINDS LILLIEFORS-STEPHENS STATISTIC FOR TESTING IF A SAMPLE IS FROM AN EXPONENTIAL DISTRIB. BY TAKING SUCCESSIVE WAITING TIMES FROM A DISCRETE PROCESS, CAN TEST WHETHER PROCESS IS POISSON ALSO PUTS OUT N, DSUP, AND ASYMPTOTIC CRITICAL VALUES.

REQUIREMENTS:
SUGI 77 PROCEEDINGS
REFERENCE:

CONTACT & ADDRESS: GJERTSEN, W. R.
SAS INSTITUTE, INC.
P.C. BOX 8000
CARY NC 27511

INDEX # 16

NAME: PROC TAG

DESCRIPTION: PROVIDES ALL TELL-A-GRAPH INCLUDING BLACK-AND-WHITE/COLOR BAR, PIE, AND LINE CHARTS (LOG, LINEAR AND OTHERS). LETTERING STYLES AR AVAILABLE FOR GRAPHIC ARTS QUALITY. COLOR 35MM SLIDES BY PROCESSING OUTPUT BY COLOR FILM RECORDER.

REQUIREMENTS: TELL-A-GRAPH AND MANY PRINTER PLOTTERS OR CRT'S INCLUDING CALCOMP, ZETA, RAMTEK, AND CHROMATICS.

REFERENCE: PROC TAG INTRODUCTORY GUIDE AND PROC TAG USER MANUAL

CONTACT & : HARRELL, FRANK
AGI DATA GRAPHICS
ADDRESS
WASHINGTON DC 20006

INDEX # 17

NAME: PROC PTPCOP

DESCRIPTION: OUTPUTS SEQ. FILE OF FORTRAN READABLE RECORDS FROM SAS DATA SET/FILE CONTAINS FULL DESCRIP. OF SEL. VAR. INCL. FORTRAN FORMAT STATEMENT ENABLING GENERALIZED FORTRAN PGMS. TO AUTOMAT. READ DATA IN OUTPUT FILE REGARDLESS OF # OR TYPE VAR. CHOSEN FROM SAS DATA SET.

REQUIREMENTS:

REFERENCE:

CONTACT & : GUDMUNDSON, C. W.
OAK RIDGE NATIONAL LABORATORY
ADDRESS
OAK RIDGE TN 37830

INDEX # 18

NAME: WCC LIBRARY

DESCRIPTION: PRINTOUT OF MEMBERS OF AN ONLINE SAS SUPPORT LIBRARY EXCLUDING SAMPLE JOBS. IT INCLUDES A TOPICAL INDEX, A FOUR PAGE PRIMER AND USAGE NOTES

REQUIREMENTS: NONE

REFERENCE: PROCEEDINGS SUGI '80

CONTACT & : MALONEY, A. W.
EPA WCC USER SUPPORT TECH SER
ADDRESS 201 WATERSIDE MALL/401 M ST. SW
WASHINGTON DC 20024

INDEX # 19

NAME: SAS/BMDP INDEX

DESCRIPTION: TOPICAL INDEX OF SAS/BMDP PROCS/PROGRAMS BY STATISTIC, ALGORITHM OR APPLICATION, E.G., CLUSTER ANALYSIS, DOLLAR LABELLING, GAUSS-SEIDEL METHOD.

REQUIREMENTS: NO COST, AVAILABLE AS CARD DECK

REFERENCE: PROCEEDINGS SUGI '80

CONTACT & : MALONEY, A. W.
EPA WCC USER SUPPORT TECH SER
ADDRESS 201 WATERSIDE MALL/401 M ST. SW
WASHINGTON DC 20024

INDEX # 20

NAME: PRCC SPSS

DESCRIPTION: INTERFACES SAS WITH SPSS.

REQUIREMENTS: NO COST, SPSS SYSTEM

REFERENCE: SPSS MANUAL

CONTACT & ADDRESS: BEUTEL, PETER
U. HEIDELBERG COMPUTER CENTER
IM NEUENHEIMER SELD 293, D-6900
D-6900 HEIDELBERG . WEST GERMANY

INDEX # 21

NAME: PRCC CLUSTAN

DESCRIPTION: INTERFACES SAS WITH CLUSTAN--CLUSTER ANALYSIS PROGRAMS

REQUIREMENTS: NO COST, CLUSTAN SYSTEM

REFERENCE: CLUSTAN USER'S MANUAL, 3RD EDITION, ED. WISHART

CONTACT & ADDRESS: BEUTEL, PETER
U. HEIDELBERG COMPUTER CENTER
IM NEUENHEIMER SELD 293, D-6900
D-6900 HEIDELBERG . WEST GERMANY

INDEX # 22

NAME: PRCC RAMIS

DESCRIPTION: INTERFACES SAS WITH RAMIS--DBM SYSTEM

REQUIREMENTS: NO COST, RAMIS SYSTEM

REFERENCE: RAMIS USER'S MANUAL

CONTACT & ADDRESS: BEUTEL, PETER
U. HEIDELBERG COMPUTER CENTER
IM NEUENHEIMER SELD 293, D-6900
D-6900 HEIDELBERG . WEST GERMANY

Note: Future indexes will include entries on teaching aids, methods, and ideas. Contributions may be sent to Helene Cavior, 1921 Glenhaven Avenue, Walnut Creek, CA 94595.

rate is controlled per variable; the error rate is experiment-wise (as long as there is but one response variable tested). Classically the treatments are unrelated to one another; but an example in Dunnett's paper and common practice among experimenters use the test when the treatments are progressively higher doses of a common treatment. Because the error rate is fixed experiment-wise, pretesting with an ANOVA is superfluous as long as the control verses treatment comparisons are the comparisons of interest.

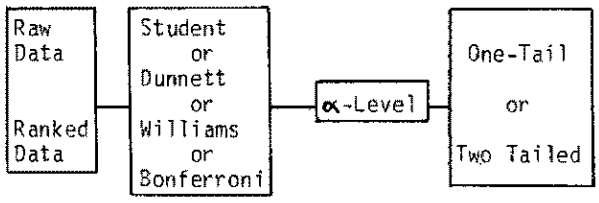
Williams t is designed to test progressively higher doses against an untreated, common control and requires the dose response to be monotone. The error rate is experiment-wise (as long as there is but one response variable tested). It requires pre-specification (or scrutiny of the data) of the direction of the testing. In our formulation of the Williams test, the following mathematical formulation of treatment means and numbers of observations give the direction of testing:

$$D = (\Sigma i \cdot n_i(\bar{x}_i - \bar{x}_o))/\Sigma(i \cdot n_i).$$

Bonferroni t is described by Miller; the test error rate is experiment-wise across treatment groups within a parameter and across parameters. The error rate is an upper bound on the total numbers of tests and does not require independence of the comparisons being made. The error rate is almost exact if the per comparison error rate is small and the comparisons independent. It is overly conservative if the comparisons and/or parameters are not independent.

Figure 1 gives the options for statistical hypothesis testing.

Figure 1 Diagram of Statistical Options



The question naturally arises: Which of these statistical options is most appropriate? The answer naturally depends upon the circumstances. First, if the error structures of the various groups is homogenous and normally distributed, analysis of the raw data is appropriate; departures from these requirements must be rather severe before the error rates of statistical testing are upset markedly. If the departures are marked, then some form of nonparametric analysis is appropriate. TABLES uses the ranked data to compute a nonparametric analysis. Use of the ranked data, even when the unranked data is appropriate, extracts a very modest price in terms of the experiments ability to detect real changes - about 5% loss of power - so that many theoreticians argue that if there is any question about the usual assumptions, homogeneity and normality, one should analyze the ranked data.

Second, the method of statistical testing must be chosen. Table 1 gives the pertinent attributes of the four available tests. If one is comparing a single treatment to control, or if only one statistical comparison is being made, the Student t is appropriate. If multiple unrelated treatments are being compared to a common control on just a single parameter, then Dunnett's t is appropriate. If the dose response is monotone and each treatment group is being compared to control within a single parameter, then Williams t is appropriate. Multiple treatments and multiple parameters require a Bonferroni t. It should be noted that seldom is a single response parameter tested; it is more usual that multiple responses are measured and tested. If this is so, then it is imperative that either the per parameter error rate be adjusted to give a desired experiment-wise error rate or that investigators be fully informed of the experiment-wise Type I error rate and be prepared to consider observed results as false positives.

Third, the ∝-level depends upon the willingness to make a type I error - false positive mistake. Custom usually sets the ∝-level at .05 or .01, but these levels need not be followed slavishly.

Finally, one or two-tailed testing? If one has strong theoretical or empirical information, it can be appropriate to test only in one direction. Otherwise, two-tailed testing is appropriate. There is a mistaken practice in statistical hypothesis testing of testing in only one direction because the investigator is only "interested" in changes in a specified direction. The purpose of experimentation is to discover the effects of treatment and unless there is strong theoretical or empirical evidence to the contrary, testing must be for increases or decreases. One can always adjust the level of testing (somewhat) for power considerations.

THE TABLES PROCEDURE
Support Type: U

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PROCEDURE TABLES computes and tabulates simple univariate statistics for all applicable variables for a control group and up to nineteen treated groups.

The procedure will mark those treatment means which are significantly different from the control mean at a specified level using a one or two tailed t test on raw or ranked data according to any of the following methods:

(1) Student
(2) Dunnett
(3) Williams
(4) Bonferroni

The procedure will also check for homogeniety of variance using Bartlett's procedure at P≤.001, the level given by Anderson and McLean beyond which statistical hypothesis testing is upset. This procedure requires the data set to be sorted by the CLASSES variable within the BY variable(s).

OUTPUT

Two-way tables (classes variable by response variables) show the statistics computed on all numeric variables or on all variables given in the variables statement. The printed values are formatted such that the standard deviation will contain at least three (3) significant digits (all integer digits are kept). Significant means (Student, Dunnett, Williams, or Bonferroni t) and standard deviations of unusual variability (Bartlett, P ≤ .001) are marked. Each table is footnoted to indicate the t test method employed, the alpha level, number of tails, variables which do not meet Bartlett's test for homogeniety of variance, and whether the analyses are done on raw or ranked data. The PROC attempts to conserve paper by formatting and folding the table if necessary.

When no statistical options are specified on the PROC TABLES statement, TABLES prints, for each applicable variable and group:

(1) The mean
(2) The standard deviation
(3) The number of non-missing values

THE PROCEDURE TABLES STATEMENT

PROC TABLES Options_and_Parameters;
The options and parameters that can appear are as follows:

DATA = Data_Set_Name
The data parameter tells TABLES the SAS data set to be analyzed. If it is omitted, then the last data set created will be used.

CONTROL = Control_Group_Value
This parameter is used to specify a value which identifies the control group. If the parameter is coded, TABLES takes as the control group that group which has this specified value in the explicit or implicit CLASSES variable. If this parameter is omitted, TABLES uses the first (lowest valued) group of the classes variable as the control group. The word CONTROL may be abbreviated as CNTL or C.

STATISTIC = Type_of_Statistics
This parameter allows the user to specify the type of significance test to be performed. If this parameter is omitted, a formatted means table will be produced, but no statistical testing will be performed. The allowable statistics are as follows: STUDENT, DUNNETT, WILLIAMS, and BONFERRONI; these may be abbreviated as S, D, W, and B, respectively. The word STATISTIC may be abbreviated as STAT or S.

LEVEL = α-Level
This parameter specifies the significance level. For the Student or Bonferroni statistic, the value may range from 0.001 to 0.1; for Dunnett or Williams, the value must be either .05 or .01. If this parameter is omitted, the significance level defaults to .05. The word LEVEL may be abbreviated as L.

TAILS = 1 or 2
This parameter specifies whether a one or two tailed test will be used. If it is omitted, the default is a two tailed test. The word TAILS may be abbreviated as T.

RANKED
This option, when used, indicates the statistics are to be computed on the ranks of the variable(s) rather than the raw values. PROC TABLES performs its own ranking, preserving missing values and giving the average rank to tied values. The word RANKED may be abbreviated as RANK or R, or may even be written as NPAR.

LABEL
This option, when used, forces the printing of labels with each variable analyzed as well as the CLASSES variable. It requires that the labels be defined on the data set. The first eight characters of the label definition are printed. The word LABEL may be abbreviated as LBL or L.

STATISTICAL OPTIONS

*MEAN	Mean
*STD	Standard Deviation
STDERR	Standard Error or the Mean
*N	Number of Non-Missing Values
NMISS	Number of Missing Values
SUM	Sum
MIN	Minimum Value
MAX	Maximum Value
RANGE	Range
VAR	Variance
USS	Uncorrected Sums of Squares
CSS	Corrected Sums of Squares
T	Control Group: Tabular (Critical) T for the statistical method, α-level, and number of tails Treated Group: Sample T comparing the treated group to the control group.

*Default Statistics

PROCEDURE INFORMATION STATEMENTS

CLASSES STATEMENT - The CLASSES statement defines the variable which controls the vertical margin. The different values of this variable control the printing and statistical testing. Only the first variable in the CLASSES statement list of variables will be used. The data set must be sorted by this variable. If the CLASSES statement is not used, TABLES will consider the first variable in the explicit or implicit VARIABLES list as the CLASSES variable. The word CLASSES may be

abbreviated as CLASS. The CLASSES variable is treated as an alpha variable and the first eight characters are used.

VARIABLES STATEMENT - Computations will be performed on all numeric variables listed in the VARIABLES statement. When the CLASSES statement is omitted, TABLES uses the first variable as the CLASSES variable. If the VARIABLES statement is not present, statistics will be computed on all non-classes, non-by numeric variables in the data set. The word VARIABLES may be abbreviated as VAR.

BY STATEMENT - If a BY statement is used, the data set must be sorted by the variables in the BY statement. TABLES will treat each BY group as a separate set of control verses treatment groups. The CLASSES variable must be sorted within the lowest order BY variable.

TREATMENT OF MISSING VALUES

All forms of missing values are ignored in the computations. In handling ranked data, missing values are not assigned a rank but remain missing.

REFERENCES

Anderson, V. L., and McLean, R. A. Design of Experiments: A Realistic Approach Marcel Dekker, Inc. New York, 1974, pp 16-22.

Dunnett, C. W., "A Multiple Comparison Procedure for Comparing Several Treatments With a Control" J. American Statist. Assoc. 50, pp 1096-1121, 1955.

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Miller, Rupert G. Simultaneous Statistical Inference McGraw-Hill Book Company 1966 pp 67-70, 129-172.

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Williams, D. A., "A Test for Differences Between Treatment Means When Several Dose Levels are Compared With a Zero Dose Control" Biometrics Vol 27, pp 103-117 1971.

Williams, D. A., "The Comparison of Several Dose Levels with a Zero Dose Control" Biometrics Vol 28, pp 519-531 1972.

EXAMPLE 1. PROC TABLES; CLASSES TRT; BY SEX;

PROCEDURE T A B L E S DEMONSTRATION
BY FRACTION AND YOUNG
ELI LILLY & CO.
RAT GROWTH DATA

SEX=F

TRT	STAT	W1	W4	W8	W14
0.0000	MEAN	92.89	137.78	171.89	198.78
	STD	8.81	10.37	9.48	9.65
	N	9	9	9	9
1.0000	MEAN	95.70	123.90	157.00	181.30
	STD	4.62	4.25	10.01	10.04
	N	10	10	10	10
2.0000	MEAN	92.80	116.50	148.70	168.80
	STD	5.35	7.49	4.08	4.59
	N	10	10	10	10
3.0000	MEAN	90.20	109.30	129.20	151.50
	STD	6.94	10.38	7.91	6.47
	N	10	10	10	10

PROCEDURE T A B L E S DEMONSTRATION
BY FRACTION AND YOUNG
ELI LILLY & CO.
RAT GROWTH DATA

SEX=M

TRT	STAT	W1	W4	W8	W14
0.0000	MEAN	103.20	193.2	278.9	337.50
	STD	11.25	14.1	10.5	16.26
	N	10	10	10	10
1.0000	MEAN	98.40	152.7	205.7	243.70
	STD	15.03	15.3	13.9	13.44
	N	10	10	10	10
2.0000	MEAN	92.00	147.0	200.3	234.80
	STD	6.09	13.4	10.7	10.05
	N	10	10	10	10
3.0000	MEAN	99.70	144.5	194.9	227.80
	STD	14.96	14.3	10.7	9.65
	N	10	10	10	10

EXAMPLE 2. PROC TABLES STAT=STUDENT TAILS=2 LEVEL =.05 LABEL MEAN STD N T; CLASSES TRT; BY SEX;

PROCEDURE T A B L E S DEMONSTRATION
BY FRACTION AND YOUNG
ELI LILLY & CO.
RAT GROWTH DATA

---------- SEX=F ----------

TRT MG/KG	STAT	W1 GRAMS	W4 GRAMS	W8 GRAMS	W14 GRAMS
0.0000	MEAN	92.89	137.78	171.89	198.78
	STD	2.97	3.22	3.08	3.11
	N	9	9	9	9
	TABLE T	2.030	2.030	2.030	2.030
1.0000	MEAN	95.70	123.90*	157.00*	181.30*
	STD	2.15	2.06	3.16	3.17
	N	10	10	10	10
	T	0.933	-3.576	-3.968	-4.777
2.0000	MEAN	92.80	116.50*	148.70*	168.80*
	STD	2.31	2.74	2.02	2.14
	N	10	10	10	10
	T	-0.030	-5.483	-6.179	-8.193
3.0000	MEAN	90.20	109.30*	129.20*	151.50*
	STD	2.63	3.22	2.81	2.54
	N	10	10	10	10
	T	-0.893	-7.338	-11.376	-12.921

* : P <= .05, TWO TAILED STUDENT T ON RAW DATA.
# : P <= .001, UNUSUAL VARIABILITY, BARTLETT.

EXAMPLE 3. PROC TABLES STAT=BON TAILS=2 LEVEL=.05 MEAN STD N T LABEL RANK; CLASSES TRT; BY SEX;

PROCEDURE T A B L E S DEMONSTRATION
BY FRACTION AND YOUNG
ELI LILLY & CO.
RAT GROWTH DATA

---------- SEX=F ----------

TRT MG/KG	STAT	W1 GRAMS	W4 GRAMS	W8 GRAMS	W14 GRAMS
0.0000	MEAN	20.11	33.00	33.56	34.17
	STD	14.50	7.84	4.92	3.77
	N	9	9	9	9
	TABLE T	3.066	3.066	3.066	3.066
1.0000	MEAN	25.10	24.30	24.65*	25.00*
	STD	7.85	5.60	7.95	6.19
	N	10	10	10	10
	T	0.969	-2.663	-3.665	-4.468
2.0000	MEAN	19.95	14.95*	17.35*	16.60*
	STD	10.02	8.16	3.53	4.00
	N	10	10	10	10
	T	-0.031	-5.524	-6.669	-8.562
3.0000	MEAN	14.85	9.05*	5.80*	5.65*
	STD	11.80	6.64	3.39	3.27
	N	10	10	10	10
	T	-1.022	-7.330	-11.423	-13.899

* : P <= .05, TWO TAILED BONFERRONI T ON RANKED DATA.
PER COMPARISON ERROR RATE = .0020833.
: P <= .001, UNUSUAL VARIABILITY, BARTLETT.
NOTE: UNITS EXPRESSED ARE THOSE OF THE RAW DATA.

EXAMPLE 4. PROC TABLES STAT=DUN TAILS=1 LEVEL=.01 MEAN MIN MAX RANGE T LABEL RANK; CLASSES TRT; BY SEX;

PROCEDURE T A B L E S DEMONSTRATION
BY FRACTION AND YOUNG
ELI LILLY & CO.
RAT GROWTH DATA

---------- SEX=F ----------

TRT MG/KG	STAT	W1 GRAMS	W4 GRAMS	W8 GRAMS	W14 GRAMS
0.0000	MEAN	20.11	33.00	33.56	34.17
	MIN	1.00	13.00	24.00	28.00
	MAX	38.50	38.50	39.00	39.00
	RANGE	37.50	25.50	15.00	11.00
	TABLE T	2.837	2.837	2.837	2.837
1.0000	MEAN	25.10	24.30	24.65*	25.00*
	MIN	11.00	15.50	8.00	12.50
	MAX	36.00	31.00	34.00	34.00
	RANGE	25.00	15.50	26.00	21.50
	T	0.969	-2.663	-3.665	-4.468
2.0000	MEAN	19.95	14.95*	17.35*	16.60*
	MIN	7.00	4.00	12.00	9.50
	MAX	36.00	26.50	23.00	22.00
	RANGE	29.00	22.50	11.00	12.50
	T	-0.031	-5.524	-6.669	-8.562
3.0000	MEAN	14.85	9.05*	5.80*	5.65*
	MIN	2.00	1.00	1.00	1.00
	MAX	38.50	20.00	11.00	11.00
	RANGE	36.50	19.00	10.00	10.00
	T	-1.022	-7.330	-11.423	-13.899

* : P <= .01, ONE TAILED DUNNETT T ON RANKED DATA.
# : P <= .001, UNUSUAL VARIABILITY, BARTLETT.
NOTE: UNITS EXPRESSED ARE THOSE OF THE RAW DATA.

EXAMPLE 5. PROC TABLES STAT=BON TAILS=2 LEVEL=.01 MEAN STD N T CONTROL=3 LABEL; CLASSES TRT; BY SEX;

PROCEDURE T A B L E S DEMONSTRATION
BY FRACTION AND YOUNG
ELI LILLY & CO.
RAT GROWTH DATA

---------- SEX=F ----------

TRT MG/KG	STAT	W1 GRAMS	W4 GRAMS	W8 GRAMS	W14 GRAMS
0.0000	MEAN	92.89	137.78*	171.89*	198.78*
	STD	8.81	10.37	9.48	9.65
	N	9	9	9	9
	T	0.893	7.338	11.376	12.921
1.0000	MEAN	95.70	123.90*	157.00*	181.30*
	STD	4.62	4.25	10.01	10.04
	N	10	10	10	10
	T	1.876	3.865	7.611	8.367
2.0000	MEAN	92.80	116.50	148.70*	168.80*
	STD	5.35	7.49	4.08	4.59
	N	10	10	10	10
	T	0.887	1.906	5.339	4.857
3.0000@	MEAN	90.20	109.30	129.20	151.50
	STD	6.94	10.38	7.91	6.47
	N	10	10	10	10
	TABLE T	3.657	3.657	3.657	3.657

* : P <= .01, TWO TAILED BONFERRONI T ON RAW DATA.
PER COMPARISON ERROR RATE = .0004167.
: P <= .001, UNUSUAL VARIABILITY, BARTLETT.
@ : TREATED AS CONTROL GROUP FOR STATISTICAL TESTING.

EXAMPLE 6. PROC TABLES LABEL;
CLASSES TRT; BY SEX;

PROCEDURE T A B L E S DEMONSTRATION
BY FRACTION AND YOUNG
ELI LILLY & CO.
RAT GROWTH DATA

---------- SEX=F ----------

TRT MG/KG	STAT	W1 GRAMS	W2 GRAMS	W3 GRAMS	W4 GRAMS	W5 GRAMS
0.0000	MEAN	92.89	106.33	123.56	137.78	150.89
	STD	8.81	9.86	11.59	10.37	11.50
	N	9	9	9	9	9
1.0000	MEAN	95.70	98.40	110.00	123.90	136.40
	STD	4.62	5.25	5.23	4.25	4.65
	N	10	10	10	10	10
2.0000	MEAN	92.80	95.80	103.80	116.50	129.30
	STD	5.35	6.48	8.42	7.49	6.88
	N	10	10	10	10	10
3.0000	MEAN	90.20	88.80	98.50	109.30	119.10
	STD	6.94	8.52	9.78	10.38	10.83
	N	10	10	10	10	10

TRT MG/KG	STAT	W6 GRAMS	W7 GRAMS	W8 GRAMS	W9 GRAMS	W10 GRAMS
0.0000	MEAN	158.67	170.11	171.89	184.67	182.89
	STD	11.92	10.37	9.48	9.08	8.87
	N	9	9	9	9	9
1.0000	MEAN	146.10	155.00	157.00	166.50	167.80
	STD	7.16	7.97	10.01	9.40	9.11
	N	10	10	10	10	10
2.0000	MEAN	136.50	145.20	148.70	155.60	154.00
	STD	5.76	4.24	4.08	5.17	6.18
	N	10	10	10	10	10
3.0000	MEAN	121.90	128.60	129.20	136.10	138.00
	STD	9.87	10.17	7.91	6.82	7.77
	N	10	10	10	10	10

SUGI SASWARE INDEX BY KEYWORD

INDEX #	KEYWORD
6	ANOVA
22	BASE
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2	BIT
11	BIT
3	CALCOMP
7	CALCOMP
16	CHARTS
21	CLUSTER
4	CONTRASTS
22	DATA
17	DATASET
10	DISTRIBUTION
1	DISTRIBUTIONS
18	EDUCATION
1	ESTIMATICN
5	ESTIMATICN
10	ESTIMATION
15	EXPONENTIAL
4	FACTORIAL
17	FORTRAN
9	GRAPHICS
16	GRAPHICS
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19	INDEX
1	KAPLAN-MEIR
13	KOLMOGOROV-SMIRNOV
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18	LIBRARY
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22	MANAGEMENT
2	MANIPULATION
11	MANIPULATION
18	ONLINE
15	OPERATIONS
17	OUTPUT
7	PLOT
3	PLOTTER
3	PLOTTING
9	PLOTTING
15	POISSON
22	RAMIS
10	RANDOM
12	RECODING
5	REGRESSION
15	RELIABILITY
15	RESEARCH
5	RIDGE
10	SAMPLING
20	SPSS
2	SUBSTRING
11	SUBSTRING
1	SURVIVAL
20	SYSTEM
21	SYSTEM
22	SYSTEM
4	TABULAR
15	TESTING
18	TRAINING
12	TRANSFORMATION

SUGI SASWARE INDEX OF
COMPUTER CODES DEVELOPED AND DOCUMENTED BY SAS USERS

INDEX # 1

NAME: MACRO KM

DESCRIPTION: THIS MACRO HAS ONE-HALF PAGE OF CODE FOR KAPLAN-MEIR ESTIMATION OF SURVIVAL DISTRIBUTIONS

REQUIREMENTS:

REFERENCE:

CONTACT & ADDRESS : HARRELL, FRANK
BIOSTATISTICS DEPT.
UNIVERSITY NORTH CAROLINA
CHAPEL HILL NC 27514

INDEX # 2

NAME: FUNCTION PUTBIT

DESCRIPTION: ALLOWS USERS TO STORE ANY BIT STRING SUBSET OF A SAS VARIABLE

REQUIREMENTS: 4 K

REFERENCE:

CONTACT & ADDRESS : HARRELL, FRANK
BIOSTATISTICS DEPT.
UNIVERSITY NORTH CAROLINA
CHAPEL HILL NC 27514

INDEX # 3

NAME: PRCC PLOTTER

DESCRIPTION: LINE/PLOT PLOTTING FOR CALCOMP PLOTTER

REQUIREMENTS: LOCALLY WRITTEN BASIC SYMBOL AND LINE PLOTTING SUBROUTINES AND CALCOMP PLOTTER WITH 110K OF CORE.

REFERENCE:

CONTACT & ADDRESS : HARRELL, FRANK
BIOSTATISTICS DEPT.
UNIVERSITY NORTH CAROLINA
CHAPEL HILL NC 27514

INDEX # 4

NAME: MACRO TABULAR

DESCRIPTION: USES TABULAR METHOD OF ANALYSIS TO COMPUTE USER SPECIFIED SINGLE DEGREE OF FREEDOM LINEAR CONTRASTS ON TREATMENT MEANS FROM BALANCED FACTORIAL EXPERIMENTS. EASIER AND MORE CONVENIENT THAN GLM.

REQUIREMENTS: 85 CARD IMAGES

REFERENCE:

CONTACT & : CARMER, SAMUEL
AGRONOMY DEPT.
ADDRESS: UNIVERSITY ILLINOIS
URBANA IL 61801

INDEX # 5

NAME: MACRO RIDGREGR

DESCRIPTION: CALCULATES COEF. OF RIDGE REGRESS. AND ALLOWS SELECTION OF APPROPRIATE COEF. VALUES. USER SPECIFIES DEP. VARIABLE & RANGE OF K (BIAS) VALUES FOR ANALYSIS. OUTPUTS MEANS, VARIANCES, CORR. MATRIX, EIG VAR. INFLATION FACTORS & OTHER STAT. WITH RIDGE TRACE PLOT.

REQUIREMENTS: USES SAS 76.5 PROC'S FORMAT, MATRIX, AND PLOT

REFERENCE:

CONTACT & : ROGERS, ROBERT HILDEBRAND, E.
USDA FOREST SERVICE
ADDRESS: UNIVERSITY MISSOURI
COLUMBIA MO 65201

INDEX # 6

NAME: PROC ANOVMEAN

DESCRIPTION: PERFORMS A ONE-WAY ANOV USING GROUP SIZES, MEANS AND STANDARD DEVIATIONS AS INPUT. T-TESTS FOR 3 TYPES OF COMPARISONS: ALL GROUPS WITH THE FIRST GROUP, ALL POSSIBLE PAIRS OF GROUPS, AND USER SUPPLIED CONTRASTS

REQUIREMENTS: 37.8K

REFERENCE:

CONTACT & : TESAR, T. P.
UPJOHN COMPANY
ADDRESS: 7293-32-1
KALAMAZOO MI 49001

INDEX # 7

NAME: PROC CCPLOT

DESCRIPTION: PRODUCES A CALCOMP PLOT WITH AS MANY AS FIVE FUNCTIONS ON ONE SET OF AXES. EACH FUNCTION IS DEFINED BY A PAIR OF VARIABLES. USER CONTROLS PLOT SIZE, SYMBOLS FOR EACH FUNCTION, AXIS LABELS, LEGEND AND SCALES.

REQUIREMENTS: 48.4K

REFERENCE:

CONTACT & : TESAR, T. P.
UPJOHN COMPANY
ADDRESS: 7293-32-1
KALAMAZOO MI 49001