

Stat48Pro

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Christian Meland:	This package was originally Christian's idea. For a time we worked on it together, but eventually Christian became too busy. Christian wrote the following Stat48Pro commands: ZALPHA, and FALPHA, along with subroutines used by these commands. TALPHA and CHIALPHA were originally written by Christian, but then replaced by me to correct a few problems.
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Introduction

Stat48Pro is made up of two main components: the data manager (“Manage”) and the statistical inference package (“Stat48Pro”). The data manager is used for entering sample data, and is used as an interface for feeding statistics computed “on the fly” directly into the inferential statistics package. Stat48Pro contains most inferential statistics applications found in an elementary statistics course. This includes confidence intervals, hypothesis tests, and sample size computations. All applications may be executed from the built-in graphical interface, or directly from the command line.

Installation

To install the library to port 0: (a similar procedure applies for port 1 or 2)

- a) Remove possible older version with :0:1043 PURGE
- b) Download the library to your HP48
- c) Recall the library to the stack and purge the variable created by the download procedure.
- d) Type 0 STO
- e) Press ON-C

Using Stat48Pro

To use Stat48Pro, enter the LIBRARY menu by pressing [RS] [2], press the softmenu button for STAT48PRO, then select "STAT48PRO" or "MANAGE". "STAT48PRO" executes the graphical interface, which guides the user to an appropriate application, receives input, then executes the application. "MANAGE" executes the data manager, which stores data, and later sends statistics into the input forms in Stat48Pro. Learn to use the data manager! It is one of the strengths of the package.

The Data Manager

The Data Manager opens with a choose menu which offers the following choices

- *Add New*
This feature adds a new data set. Use the same convention for naming sample data as for naming variables on the HP48
The data manager supports the following data types:
 - A. 1-variable
 - B. 1-variable with frequencies (or weights)
 - C. 2-variable
 - D. 2-variable with frequencies (or weights)
 - E. Matrix (for 2-way contingency table (test for independence), or 2-way ANOVA with one observation per cell).
 - F. Matrix of Lists (for 2-way ANOVA with more than one observation per cell).
- *Edit Existing*
- *Delete Data*

- *Describe Data*
This option computes whatever statistics are necessary to describe a selected data set, depending on the data type.
- *Export Data*
This option copies a selected data set to either the stack, or to 'ΣDAT' for use in the HP48's own statistics package.
- *Import Data*
This option imports data from the stack (or as a passed parameter when in 'algebraic' mode), or from 'ΣDAT'.

Use the data manager to store "raw" data. An unlimited number of data samples may be stored. Each sample is given a name. This name must be a valid global ID – use the same conventions used to name variables. When ready to analyze data, enter Stat48Pro and select an application. After entering your application's input form, you may enter statistics manually, *or press the [IMPRT] menu key to import statistics from the data manager.* When using the [IMPRT] feature, some applications require two (independent) samples to be selected, while others (like one-way ANOVA), require that more than two independent samples be selected. Whenever this is the case, simply use the menu key [CHK] to select several samples before pressing [OK]. Please see the table at the end of this document that describes which data types may be imported into any given application.

The data manager stores sample data in a matrix, and the all such matrices are bundled together and stored as a single library object in the variable 'ΣPRORAW'. Data that are entered into input forms are bundled together & stored in another library object called 'ΣPRODAT'. Deleting either of these variables from memory will destroy your data, so exercise caution. If you need to remove data stored by the data manager, use the delete function included in the data manager.

Conventions

Stat48Pro uses the following notational conventions:

μ	population mean
\bar{x}	sample mean
π	population proportion
p	sample proportion
σ	population standard deviation
s	sample standard deviation
ρ	population correlation coefficient
r	sample correlation coefficient

Other conventions:

- "TS" stands for "test statistic", while "pval" stands for "p-value".
- Confidence intervals that use the z or t distributions return the interval, as well as a value E. Most texts refer to E as the "maximum error in the estimate" of whatever parameter is being estimated.
- One sided confidence intervals are supported indirectly. To perform one, simply use the application which performs the 2-sided interval, and double your α -- by changing your confidence level to $1-2\alpha$.
- Two applications, namely TT2I μ and TC2I μ require a parameter POOL? which tells the application what to do regarding the pooling of variances. The choices are as follows:

A. "Unpooled" using degrees of freedom given by $df = \frac{(V_1 + V_2)^2}{\frac{V_1^2}{n_1 - 1} + \frac{V_2^2}{n_2 - 1}}$ where $V_1 = \frac{s_1^2}{n_1}$ and $V_2 = \frac{s_2^2}{n_2}$.

B. "Pooled" using $df = n_1 + n_2 - 2$.

C. "Unpooled EZ DF" uses degrees of freedom given by $df = \min\{n_1 - 1, n_2 - 1\}$.

D. "F-test decides" runs an F test to test for equal variances, and then runs the current application according to the results of the F test. Degrees of freedom used are either those given in A or B above.

E. "F-test EZ DF" runs an F test to test for equal variances, then runs the current application according to the results of the F test. Degrees of freedom used are either those given in B or C above.

F. The "Normal Probability Plot" application is used to check for normality in a sample. There are several different formulas for computing the area to the left of the I 'th quantile on the normal distribution. Stat48Pro allows the user to modify the formula for this area. The default is $(I-3/8)/(N+1/4)$. The user may change this in the input form, but the symbolic entered must be a function of I and N . There is no need to purge global variables I or N if they exist.

G. Notations: TS = Test Statistic, CV = Critical Value, pval = p-value.

The following conventions are necessary *only* when running applications directly from a command prompt. You may ignore this section if you plan to use the graphical interface exclusively to launch applications.

- All hypothesis tests require a parameter [α ,TAILS], where α is the level of significance, and TAILS is equal to -1 for a left-tail test, 0 for a 2-tail test, and 1 for a 1-tail test.

I hope that you find this software useful. If you do, please drop me a note at sguth@mtsac.edu. Comments & suggestions are welcome. On the following page is a complete list of all applications offered in Stat48Pro.

Stat48Pro Inferential Statistics Applications

The current applications performed by Stat48Pro are listed below. All are accessible through the graphical interface of Stat48Pro with a few exceptions. In addition, all commands may be executed directly from the command line. Executing any particular command without arguments will give online help for that command.

Application Name	Application Purpose	Allowed Data Types for Import
ZT μ	z test for pop. mean	1Var; 1Var/Freq
ZC μ	z conf. int. for pop. mean	1Var; 1Var/Freq
N μ	sample size for estimating pop. mean	1Var; 1Var/Freq
TT μ	t test for pop. mean	1Var; 1Var/Freq
TC μ	t conf. int. for pop. mean	1Var; 1Var/Freq
ZT π	z test for pop. proportion	No import allowed.
ZC π	z conf. int. for pop. proportion	No import allowed.
N π p	sample size for pop. proportion -- estimate p is known	No import allowed.
N π	sample size for pop. proportion -- estimate p is not known	No import allowed.
ChiT σ	Chi ² test for pop std. dev. or variance.	1Var; 1Var/Freq
ChiC σ	Chi ² conf. int. for pop. std. dev. or variance.	1Var; 1Var/Freq
ZT2D μ	z test for two means, dependent samples	2Var; 2Var/Freq
ZC2D μ	z conf. int. for two means, dependent samples	2Var; 2Var/Freq
TT2D μ	t test for two means, dependent samples	2Var; 2Var/Freq
TC2D μ	t conf. int. for two means, dependent samples	2Var; 2Var/Freq
ZT2I μ	z test for 2 means, independent samples	1Var; 1Var/Freq Multi-choose
ZC2I μ	z conf. int. for 2 means, independent samples	1Var; 1Var/Freq Multi-choose
TT2I μ	t test for 2 means, independent samples. This test requires a parameter [α ,tails,pool?], where "tails" is equal to -1 for a left-tail test, 0 for a 2-tail test, and 1 for a 1-tail test, and "pool?" is a real number equal to one of the following: 0=unpooled, 1=pooled, 2=unpooled/EZ DF, 3=F-test decides, 4=F-test/EZ DF. For the meaning of these options, see items A through E on the preceding page.	1Var; 1Var/Freq Multi-choose
TC2I μ	t conf. int. for 2 means, independent samples. This command requires a parameter [conf, pool?] where "conf" is the level of confidence, and "pool?" is as described for TT2I μ above.	1Var; 1Var/Freq Multi-choose
ZT2 π	z test for 2 pop. proportions	No import allowed.
ZC2 π	z conf. int. for 2 pop. proportions	No import allowed.
FT2 σ	F test for two variances	1Var; 1Var/Freq Multi-choose
FC2 σ	F conf. int. for two variances	1Var; 1Var/Freq Multi-choose
CONTING	Contingency tables	Matrix
GOODFIT	Chi-square test for fit.	2Var; 2Var/Freq
ANOVA1	One-way ANOVA	1Var; 1Var/Freq Multi-choose
ANOVA21	2-way ANOVA, one observation per cell	Matrix
ANOVA21SS	Sums of squares for ANOVA21	Not available in GUI
ANOVA2	2-way ANOVA, more than one observation per cell	List of Matrices
ANOVA2SS	Sums of squares for ANOVA2	Not available in GUI
ZTp	z test for linear correlation	2Var; 2Var/Freq
TTp	t test for linear correlation	2Var; 2Var/Freq
ZTpFisher	z test for linear correlation (claiming that $\rho = \rho_0 \neq 0$) using Fisher transform.	2Var; 2Var/Freq
ZALPHA	z critical values (inverse z distribution).	No import allowed.
TALPHA	t critical values (inverse t distribution).	No import allowed.
CHIALPHA	Chi ² critical values (inverse Chi ² distribution).	No import allowed.
FALPHA	F critical values (inverse F distribution).	No import allowed.
RankSum	Input: { list of real vectors } Output: 3: {list of sample sizes} 2: {list of original vectors - but paired with overall rankings} 1: {list of Rank-Sums} So the input requires each sample stored in vector, and each vector stored in a single list. Execute the command and you get the sum of the ranks for each sample. These ranks may be used in several non-parametric tests (and getting the ranks is really the hardest part of these tests), namely: 1. The Wilcoxon Rank-Sum test; 2. The Mann-Whitney U test; 3. The Kruskal-Wallis test.	1Var Multi-choose
NORMPLOT	Plots a normal probability plot, gives normal scores, and computes r, the correlation coefficient. Note: this function will alter the contents of Σ DAT.	1Var
ZSCORES	Computes normal scores for a given sample size.	Not available in GUI