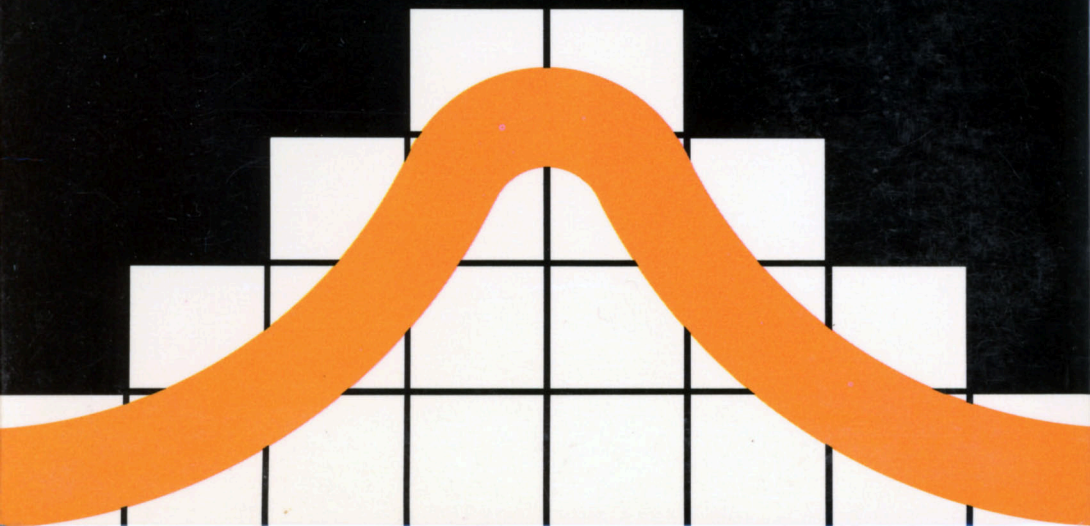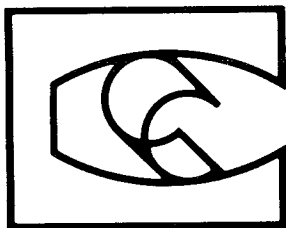# STATISTICS III.

STATISTICS III

Compucolor II

SOF-DISK LIBRARY

A system for applications in time series analysis.

Library Album No. 993003   Requires 16K user RAM

STATISTICS III
(TIME SERIES)

TABLE OF CONTENTS

Statistics III is a system of 5 programs plus a "MENU" program which operates on numerical data primarily for applications in time series analysis. It consists of the following programs, each of which is described below: FILES, TIMSER, INDEX, CMPTIM, and RANK.

FILES

This is the file manager program. It generates, maintains and displays files of numbers for use by the other programs. A file consists of a set of "observations" each of which is an n-tuple of numbers for a fixed n from 1 to 6. The first numbers in the n-tuples of a file form a data set, referred to as "type 1", the second numbers form another data set, "type 2", etc. A file may contain up to 175 observations. This limit may be increased by adjustments of DIM statements in the FILES program (line 30) and in other programs which will use the files.

When FILES is run, the following prompt is displayed:

SELECT NUMBER OF DESIRED ACTION:
1) CREATE FILE
2) DELETE FILE
3) ALTER OBSERVATIONS
4) ADD AND/OR DELETE OBSERVATIONS
5) DISPLAY FILE
6) MERGE FILES
7) END PROGRAM
?

1) To create a new file on disk, type "1", followed by a carriage return (CR). The following prompt is then displayed:

FILE NAME AND NUMBER OF TYPES:

The desired file name (1 to 6 characters) should now be entered, followed by a comma, followed by the number of items/observation. The next prompt is:

NUMBER OF OBSERVATIONS:

and when answered (followed by CR), the prompt

                ENTER "0" WHEN DONE
                DATA:
                #

appears. Each observation is now entered by typing first the
number of the observation, then (CR), then the numbers for the
respective "types" of the observation, each followed by (CR). The
observations may be typed in any order and mistakes may be
corrected by retyping the numbers of the observation. When
finished, type "0" (CR) and the original prompt returns. The new
file is now on disk.

2) To delete a disk file, type "2" (CR) and the directory is
    displayed followed by the prompt:

                COMPLETE NAME OF FILE TO BE DELETED:

    The file name followed by ".", followed by file type, followed by
    ";", followed by version number should now be entered as it
    appears in the directory, then (CR). The file is deleted (using
    the screen memory in the process) and the revised directory is
    briefly displayed before the original prompt returns.

3) To alter observations already in a file, type "3" (CR) and the
    prompt

FILE NAME:

appears whereupon the name of the disk file to be altered should be entered. The file is loaded from disk followed by:

ENTER "0" WHEN DONE
DATA:
#

The corrected observations should now be entered as described above for the same prompt. The file on disk is corrected and the original prompt returns.

4) To add and/or delete observations from a disk file, type "4" (CR) and

ENTER "D" (DELETE) OR "A" (ADD) & OBSERVATION NUMBER
ENTER "F,O" WHEN DONE

appears. Additions and deletions as well as observation numbers may be processed in any order. To delete an observation, enter "D," followed by the observation number (then CR). Warning: subsequent observation numbers are now decreased by 1! To add an observation, enter "A," followed by the observation number (then (CR)). Warning: already existing observation numbers from this one up are now increased by 1! When finished, enter "F,0" (CR). A new file of the same name and next higher version number is now placed on disk and the old file remains. The original prompt returns.

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5) To display a file which is on disk, type "5" (CR) and the prompt

FILE NAME:

appears to which the name of the desired file (then (CR)) should be entered. This is followed by:

THIS FILE WAS CREATED BY
1 - THE "FILES" PROGRAM
2 - ONE OF THE OTHER STATISTICS PROGRAMS

a) If a "1" is input, the next prompt is

BEGINNING OBSERVATION NUMBER (OR '0' TO END):

When an observation number is typed in, a screen of successive observations beginning with that one is displayed, followed by the same prompt. When finished, enter "0" (CR) and the original prompt returns.

b) If a "2" is input, the file is displayed on the screen but no prompt appears. To return to the original prompt, press "return".

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6) To merge two or more files together, type "6" (CR). Files may be merged in one of two ways: files which contain the same number of types may have observations merged, or files which contain the same number of observations may have types merged. The prompt

NEW FILE NAME:

is displayed whereupon the desired name for the merged file should be entered (and (CR)). Next appears

ENTER 1-MERGE OBSERVATIONS OR 2-MERGE TYPES

a) If a "1" is typed, the next prompt is

MERGE FILE NAME (OR "0" IF DONE)

and the name of the first disk file to be merged should be entered (and (CR)). As the names of the successive files to be merged are entered, the prompt MERGE FILE NAME is repeatedly displayed. After the last file name has been entered and the prompt again appears, enter "0" (CR) and the original prompt returns. The merged file is now on disk.

b) If a "2" is typed, the next prompt is

FILE NAME & # TYPES TO MERGE (OR '0,0' IF DONE):
The name of the first file to be merged and the number of types from this file to be used in the merge should

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now be entered, separated by a comma and followed by (CR). The prompt TYPE 1: next appears and the number of the type (1 to 6) to be merged first is entered (and (CR)). If more than one type is to be used from this file then TYPE 2: appears next, etc. The prompt

MERGE FILE NAME & # TYPES TO MERGE:

is repeatedly displayed as the files to be used in the merge are called for. After all the merge information has been entered and the prompt reappears, enter "0,0" (CR) and the original prompt returns. The merged file is now on disk.

7) To return to the MENU program, type "7" (CR).

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TIMSER

This program performs trend regression, deseasonalization or other cyclic adjustments and smoothing of a time series. It maintains 3 sets of data: the original time series, the data input to the most recent adjustment and the data resulting from the latest adjustment. Initially, all 3 data sets are the same. The latter two data sets may be displayed or graphed.

When TIMSER is run, the following prompt is displayed:

    DATA SOURCE (F-FILE OR K-KEYBOARD):

Enter "F" if the time series to be used is in an already existing disk file or "K", otherwise. If "F" is entered, the next prompt is

    FILE NAME AND TYPE NUMBER:

to which is entered the disk file name, followed by a comma, followed by "type" (described above under "FILES"). If "K" is entered to the original prompt

    NUMBER OF DATA POINTS

appears next, which should be answered accordingly. This is followed by

    NUMBER OF DATA POINT, VALUE:
    #

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The time series values are now entered respectively by keyboard as described above for "FILES". After the data has been entered either from a disk file or by the keyboard, the next prompt to appear is

DATA POINTS PER TIME PERIOD:

This information is used for deseasonalization and graphing. In a typical case, data points are monthly values and the unit time period is a year. In this case, "12" should be entered. The prompt listing the alternatives appears now (and is repeated after each action not terminating the program). It is

ENTER NUMBER OF CHOICE:
1 - COMPUTE NEW DATA
2 - ADJUST NEW DATA
3 - GRAPH DATA
4 - DISPLAY DATA
5 - RESET ORIGINAL DATA
6 - DISPLAY STATISTICS
7 - END PROGRAM
?

Each of these alternatives will now be described:

1) To perform a calculation on the present data to generate a new set of data, enter "1" and the following prompt appears:

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TYPE OF COMPUTATION:
1 - DESEASONALIZE (CENTERED MOVING AVERAGE)
2 - TREND (REGRESSION)
3 - IRREGULARITIES (SMOOTHING)
4 - CYCLES (MOVING AVERAGE)
5 - PERIODIC CYCLES (FOURIER REGR.)
?
```

To deseasonalize the present data, enter "1" and, after a pause as computations take place, the computed indices appear and the deseasonalized data becomes the present data. At the bottom of the screen appears

    PRESS "RETURN" TO RETURN

and upon pressing return, the prompt with the most general alternatives returns. To compute a regression equation (least squares), enter "2" and the following prompt appears:

    SELECT NUMBER OF REGRESSION EQUATION:
    1) LINEAR $Y = AX+B$
    2) LOGARITHMIC $Y = LOG(AX+B)$
    3) EXPONENTIAL $Y = EXP(AX+B)$
    4) RECIPROCAL $Y = 1/(AX+B)$

to which should be entered the type of regression equation desired. NOTE: A poor choice here may result in extreme values, so that no regression equation can be generated. After a pause as computations take place, the coefficients (values of A and B) of the regression equation are displayed and the PRESS "RETURN" TO RETURN prompt appears as above. To smooth irregularities, enter "3" and the next prompt is

PERIOD:

to which should be entered the order of moving average to be used. After a pause as computations take place, the smoothed data is generated and a return to the 7 alternatives occurs. To adjust for cycles, enter "4" and a weighted (centered if period is to be even) moving average is computed. The values other than the endpoints are weighted by a factor of 2 if the period is even. The next prompt is PERIOD: as for the case where "3" is entered. To fit a Fourier series to the data, enter "5" and the next prompt is

MAXIMUM ORDER OF HARMONICS?

which should be answered accordingly. A pause now occurs as computations take place. If the size of the data set is larger or the response to this last prompt is more than 7 or 8, the pause may be lengthy. The computed Fourier coefficients are displayed and the prompt

PRESS "RETURN" WHEN READY

appears. Upon pressing return, the 7 alternatives reappear.

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2) To subtract out the resulting data from the data producing the result, enter "2". To the new data thereby generated is added the mean of the original data so that it may be graphed without a change of scales. Such adjustment is for the purpose of eliminating the effect of influences causing trend, cycles, etc.

3) To graph data to compare values before and after the last computation, enter "3". If this choice is being made for the first time in this run of the program, the next prompt is

GRAPH NAME:

The name which is to appear across the top of the screen when the graphs are displayed is entered now. This is followed by

TIME-SCALE NAME, DEPENDENT SCALE NAME:

to which is entered the respective scale names, separated by a comma. The next two prompts are

TIME-SCALE (START, END, DIFFERENCE):

and

DEPENDENT SCALE (START, END, DIFFERENCE):

The desired beginning marked scale value, ending marked scale value and constant difference should now be entered respectively, separated by commas for each of the respective scales. Since the data are dependent values, the time values are implied. They are integers from 0 upwards. For purposes of graphing, "0" corresponds to the first data value of the first time period, '1' corresponds to the first data value of the second time period, etc. For example, if values are monthly and the time period is a year, then the time value "0" corresponds to the first data value, the time value "1" corresponds to the thirteenth etc. NOTE: The time scale can have a maximum of 8 and the dependent scale can have a maximum of 13 marked values so, in each case, the ending value entered will not appear if the difference entered is too small. The graphs appear on a rectangular coordinate system and at the bottom of the screen appears

   PRESS "RETURN" TO CONTINUE, 1-NEW SCALES OR 2-SAVE

To return to the 7 alternatives, press "return". To redisplay the graph with different scales, enter "1" and the prompt to enter scale parameters returns. To save the display as a disk file, enter "2". A disk file of the screen is then entered with the name TIMSER.DSP and a return to the 7 alternatives occurs.

4) To display the data both before and after the last computation, enter "4" and a screen of the beginning portion of the data is displayed. At the bottom of the screen appears

> BEG. DATA ITEM # (OR "0" TO RETURN):

To display a screen of data, enter the desired beginning data item number. To return to the 7 alternatives, enter "0".

5) To carry out computations using the original data rather than to continue using the present data, enter "5". The present data is replaced by the original data and the 7 alternatives return.

6) To display basic statistics of the data sets before and after the last computation, enter "6" and, after a pause as computations take place, the statistics appears. At the bottom of the screen is displayed PRESS "RETURN" WHEN READY and when "RETURN" is pressed, the prompt with the 7 alternatives returns.

7) To return to "MENU", enter "7".

INDEX

This program computes 8 types of index numbers for several sets of data.
Any of the data sets may be used as data for the base period. Periods may
be individually compared to the base period. Three values are associated
with each data item: size, amount and weight. If prices and price indices
are being used, these correspond to price, quantity and value
respectively.

When INDEX is run, the following prompt is displayed:

    DATA SOURCE (F-FILE OR K-KEYBOARD):

which should be answered as for TIMSER described above. This is followed
by

    NUMBER OF PERIODS:

Enter the number of periods of data which is to be entered. If "F" is
answered to the file prompt, there appears next

    PERIOD 1 FILE NAME (OR "S" IF SAME AS LAST)

The disk file name of the file containing the data of period 1 is now
entered whereupon appears

    SIZE TYPE #, AMOUNT TYPE #

Enter the type containing the data sizes, followed by a comma, followed by the type containing the data amounts (see "type" under FILES above). For each of the other periods, prompts corresponding to these last two, appear and are answered analogously. If a file name is the same as the one for the previous period, enter "S" when the file name is called for. Periods may be entered in any order. If "K" is answered to the first prompt, there appears

    NUMBER OF ITEMS:

which should be answered accordingly. This is followed by

    PERIOD 1 ITEM #, SIZE, AMOUNT
    #

The data for period 1 is now entered, item number, size and amount for each item respectively. Data is entered in the same manner as described for FILES above. When finished entering data for a period, type "0". Corresponding prompts appear for each period. After data has been entered, whether from disk file(s) or the keyboard, the prompt

    ENTER NUMBER OF DESIRED CHOICE:
    1 - DISPLAY INDEX NUMBERS
    2 - DISPLAY DATA WITH WEIGHTS
    3 - END PROGRAM
    ?

appears next.

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</div>

To display 8 types of index numbers for the input data, enter "1" and the following prompt appears:

ENTER 1-WEIGHT = AMOUNT OR 2-WEIGHT = SIZE X AMOUNT:

Enter "1" if the amounts are to serve as the weights for the sizes or "2" if the weights are to be the products of the sizes and the amounts. Upon entry of a response to this prompt, appears

NORMALIZE WEIGHTS?

If weights are to be divided by a constant to render their sum unity, enter "Y" or "YES". Otherwise, enter "N" or "NO". The next prompt is

BASE PERIOD?

to which is entered "1" if the first period of data entered is to be the base period, "2" if the second period is to be the base period, etc. After a pause as computations are being made, the indices for the nonbase periods appear. At the bottom of the screen is

ENTER 1-RETURN OR 2-SAVE, THEN RETURN

To return to the prompt with the three alternatives, enter "1". To save the display as a disk file, enter "2" and a disk file of the screen is created with the name INDEX.DSP and the prompt with the three alternatives returns.

To display the data of a period with weights along with that of a base period, enter "2" and the three prompts requesting types of weight, whether weights should be normalized and base period occur as above. These are followed by the prompt

PERIOD TO DISPLAY:

which should be answered by the number of the period to be displayed along with the base period. The data is then displayed and at the bottom of the screen appears ENTER 1-RETURN OR 2-SAVE, to return to "MENU", enter '3'.

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CMPTIM

This program computes variation within or between pairs of time series for a set of time series input. Up to 4 graphs of time series may be displayed on a coordinate system.

When CMPTIM is run, the following prompt is displayed:

DATA SOURCE (F-FILE OR K-KEYBOARD):

This is answered as described in TIMSER above. This is followed by

NUMBER OF SERIES:

which is answered accordingly. Next appears

DATA POINTS PER TIME PERIOD:

which is answered as for the same prompt in TIMSER described above. If "F" is answered to the original prompt, there follows

SERIES 1 FILE NAME (OR "S" IF SAME AS LAST):

The name of the disk file containing the data of the first series is entered whereupon

TYPE NUMBER:

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appears and is answered accordingly. Prompts analogous to these last two appear for each series. If "K" is answered to the original prompt, there is next displayed

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SERIES 1
NUMBER OF DATA POINTS:

</div>

When the number of data points for the first series is entered, the prompt

NUMBER OF DATA POINT, VALUE:
#

The number of each data point, followed by its value is entered in the same manner as data is entered in FILES described above. When finished entering data for the first series, enter '0' and corresponding prompts for the next series appear, etc. After the data has been entered, whether from a disk file or by keyboard, the prompt to follow is:

ENTER NUMBER OF DESIRED ALTERNATIVE:

1 - VARIATION IN EACH SERIES
2 - VARIATION BETWEEN SERIES
3 - DRAW GRAPH(S)
4 - END PROGRAM

each of which will now be described:

1 - To examine variation within the series, enter '1' and the prompt

<div align="center">

ENTER START AND END OF RANGE (E.G. 1, 36):

</div>

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</div>

appears. The beginning and ending of the series to be measured is entered, separated by a comma. In the example given in the prompt, the first through thiry-sixth values in the series will be used. Several measures of the variation within each series are displayed and at the bottom of the screen appears

ENTER 1 - RETURN or 2 - SAVE, THEN RETURN:

If '1' is entered, the prompt with the 4 alternatives returns. To save a disk file of the display, enter '2' and a disk file of the screen is created with the name CMPTIM. DSP followed by a return to the prompt listing the alternatives.

2 - To examine variation between two series, enter '2' and the prompt

SERIES PAIR TO COMPARE (E.G. 1,3):

appears. In the example given in the prompt, the first series is to be compared to the third. Answer accordingly. This is followed by

START AND END OF RANGE (E.G. 12,42):

which is answered as for the analogous prompt for the first alternative described above. In the example given in the prompt, the 12th through the 42nd values in the two series are to be used. Several measures of the variation between the two series is displayed as well as a comparison of individual values of the first portion of the series. At the bottom of the screen appears

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BEGINNING TIME (OR '0' TO RETURN):

to which should be entered the beginning point of the series to be displayed. For example, to display a portion of the values of the series beginning with the twenty-fifth value, enter 25. The display appears and the last prompt returns. When finished, enter '0' and the prompt with the 4 alternatives reappears.

3 - To draw graphs of from 1 to 4 of the series, enter '3' and

NUMBER OF GRAPHS TO PLOT (1 - 4):

appears which should be answered accordingly. This is followed by

SERIES NUMBER 1

to which is entered the number of the first series to be graphed. Analogous prompts appear for any additional series to be graphed. Answer these accordingly. The following prompts are the same as those described for the graph option in TIMSER above. After the graph is displayed, a 'RETURN' brings back the prompt with the alternatives as before.

4 - To return to 'MENU,' enter '4'.

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RANK

This program performs a rank analysis on pairs of data sets using the Mann-Whitney test and also computes rank correlation. The entry of a number called the Man-Whitney critical value is required. The fractional portion of the number sets the symmetry of the confidence limits about the two sets of data (equal symmetry for .5). The integer portion (positive and lest than the total number of possible pairs of values, one from each group) sets the calculation point about the ends of the sets of data. An integer in the middle of the allowable range results in a confidence interval about the middle of the data sets. A typical vaue is 2.5 (for computing symmetric confidence intervals about the end points).

When RANK is run, the following prompt is displayed:

    DATA SOURCE (F-FILE OR K-KEYBOARD):

This is answered as for TIMSER. The next prompt is

    NUMBER OF DATA SETS:

which is answered accordingly. If 'F' is answered to the original prompt,

    DATA SET 1 FILE NAME (OR 'S' IF SAME AS LAST):
    ?

appears next to which is answered the name of the disk file containing the first data set. This is followed by

TYPE NUMBER:

which is answered accordingly. Prompts analogous to these last two appear for each data set to be entered. If 'K' is answered to the original prompt, there next appears

DATA SET 1
NUMBER OF DATA POINTS:

which should be answered accordingly. This is followed by

NUMBER OF DATA POINT, VALUE:
#

Data is now entered for set 1 as is done for FILES described above. When finished with a data set, enter '0'. Prompts analogous to these last two appear for each data set to be entered. After the data has been entered, whether from a disk file or by keyboard, the next prompt to appear is

ENTER MANN-WHITNEY CRITICAL VALUE:

The requested critical value (described above) should now be entered. After a pause as computations are made, values pertaining to the rank test and rank correlation are displayed for a screen of pairs of data sets. At the bottom of the screen appears

ENTER 1 - RETURN, 2 - CONTINUE, 3- SAVE, or 4 - END:

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To recompute using another critical value, enter '1' and the prompt requesting the critical value returns. To display the next portion of data pair values, enter '2'. The next set is displayed and this last prompt returns. If the end of the pairs of data values has already been displayed, the beginning is displayed again. To save the display as a disk file, enter '3' and a disk file of the screen is created with the name RANK.DSP. The last prompt then returns. To return to "MENU," enter '4'.

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SCREEN EDITOR	BASIC LANGUAGE

All software is sold on an "AS IS" basis without warranty.

Compucolor Corporation
P.O. Box 569   Norcross, GA   30071
(404) 449-5961

Statistics III—Time Series
Requires 16K RAM

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RANK: This program performs a rank analysis on pairs of data series using the Mann-Whitney test and also computes rank correlation.

Compucolor® Corporation

IMPORTANT INFORMATION

A. For extended media life of your Sof-Disk™—take the following precautions.
   1. Do not put fingers on the precision surface.
   2. Insert the Sof-Disk carefully into the disk drive.
   3. Keep the Sof-Disk far from magnetic field which will erase it.
   4. Store the Sof-Disk in the jacket when not in use.
   5. Handle the Sof-Disk with care. Bending and folding will damage it.
   6. Sof-Disks are best stored at temperatures ranging from $10°$ to $52°$C or $50°$ to $125°$F.
   7. Do not leave Sof-Disk in disk drive while turning your Compucolor II ON or OFF.

B. ALL COMPUTER PROGRAMS ARE DISTRIBUTED ON AN "AS IS" BASIS WITHOUT WARRANTY.