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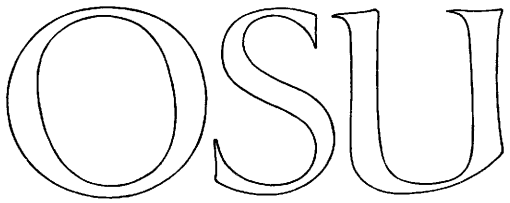
A Guide to Program Documentation for the OSU Computer Center Program Library

by Susan Margolis, David Niess and Catherine Porter

July 1, 1968



COMPUTER CENTER
Oregon State University
Corvallis, Oregon 97331

A GUIDE TO PROGRAM DOCUMENTATION FOR THE OSU COMPUTER CENTER PROGRAM LIBRARY

by: Susan Margolis
David Niess
Catherine Porter

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Program Documentation

Programs distributed through the OSU program library shall be described by the:

[1] Abstract Sheet, and

[2] a complete program write-up in accordance with a suggested documentation format.

The program write-up may be omitted if references called out in the Abstract Sheet contain all necessary information and are readily available. Also, in sections 6 and 7 of the documentation format, certain items are not applicable to all cases. These items may be omitted.

ABSTRACT SHEET

IDENTIFICATION (1.0) _____

DATE WRITTEN (1.2) _____

TITLE (1.3) _____

SOURCE LANGUAGE (1.4) _____

OPERATING SYSTEM & VERSION (1.5) _____

COMPUTER & CONFIGURATION (1.6) _____

LIBRARY MATERIALS (1.7)

- ☐ REFERENCE (1.7.1) _____
- ☐ FLOW CHARTS (1.7.2)
- ☐ SAMPLE PROBLEM (1.7.3)
- ☐ LISTING (1.7.4)
- ☐ SOURCE DECK (1.7.5)
- ☐ BINARY DECK (1.7.6)

☐ PUBLIC FILE (2.0)

PROGRAM AVAILABLE BY: (3.0)

- ☐ BATCH
- ☐ REMOTE TERMINAL

ABSTRACT: (4.0)

LIMITATIONS: (5.0)

ABSTRACT SHEET

1.0 IDENTIFICATION

(For location on Abstract Sheet, refer to page ii.)
Each program is identified in the index and on the abstract sheets by a designator consisting of the following parts:

1.0.1 Classification Code
Each program is assigned a two-character classification code.

1.0.2 Organization Code
Identifies the contributing organization. Up to four letters.

1.0.3 Program Identification
An eight letter or less alphanumeric designation assigned by the Computer Center.

1.0.4 Revision Code
Designates revision by adding a letter.
Example: B2 - WISC - ALOG10 - C

B2 = Classification Code
WISC = Organization Code
ALOG10 = Program Identification
C = Revision Code

Explanation of the Classification Code (1.0.1)

The Classification Code consists of a letter, indicating the primary class, followed by a digit indicating the sub-class, chosen from the following expandable list:

A. Programmed Arithmetic
   1. Complex
   2. Decimal
   3. Real (N-Extension)

B. Elementary Functions
   1. Trigonometric
   2. Exponential and Logarithmic

3. Hyperbolic
4. Roots and Powers
5. Conversion

C. Polynomials and Special Functions
1. Evaluation of Polynomials
2. Roots of Polynomials
3. Evaluation of Special Functions
4. Simultaneous Nonlinear Algebraic
5. Simultaneous Transcendental Equations

D. Operations on Functions and Solutions of Differential Equations
1. Numerical Integration
2. Numerical Solutions of Ordinary Differential Equations
3. Numerical Solutions of Partial Differential Equations
4. Numerical Differentiation
5. Extreme Values of Functions

E. Interpolation and Approximations
1. Table Look-up and Interpolation
2. Curve Fitting
3. Smoothing

F. Operations on Matrices, Vectors, and Simultaneous Linear Equations
1. Matrix Operations
2. Simultaneous Linear Equations
3. Determinants
4. Eigenvalues and Eigenvectors

G. Statistical Analysis and Probability
1. Data Reductions
2. Correlation and Regression Analysis
3. Sequential Analysis
4. Analysis of Variance
5. Random Number Generators

6. Time Series
7. Multivariate Analysis
9. Miscellaneous

H. Operations Research and Linear Programming

I. Input
1. Binary
2. Octal
3. Decimal
4. BCD
5. Composite

J. Output
1. Binary
2. Octal
3. Decimal
4. BCD
5. Composite
6. Analog
7. Plotter

K. Internal Information Transfer
1. Binary Tape Handler
2. BCD Tape Handler
3. General Tape Handler
4. Relocation
5. Conversion

L. Executive Routines
1. Assembly
2. Compiling
3. Automatic Operator Programs

M. Information Processing
1. Sorting
2. Conversion
3. Collating and Merging
4. Sort and Merge
5. List Processing

N. Debugging Routines
   1. Tracing, Trapping
   2. Dump
   3. Search
   4. Breakpoint

O. Simulation Programs
   1. Peripheral Equipment Simulators
   2. Computer

P. Diagnostic Programs

Q. Service Programs
   1. Clear, Reset Programs
   2. Check Sum Programs
   3. Restore, Rewind, Tape Mark, Bootstrap Programs
   4. Plotter Routines
   9. Miscellaneous

R. Operations in General Mathematical Systems
   1. Boolean Algebra
   2. General

S. Combinatorial Analysis

T. Civil Engineering

U. Nuclear Reactor Codes
   1. Burn Up (Depletion)
   2. Group Diffusion
   3. Engineering
   4. Kinetics
   5. Monte Carlo
   6. Physics
   7. Transport
   9. Miscellaneous

Z. All Others

1.2 DATE WRITTEN

The date of the original program shall be included. When submitting a revision, the date of the revision being submitted shall also be given following the word ∇REVISION∇.

1.3 TITLE [Descriptive]

The title of a program shall be limited to approximately fifty characters which are included in the basic 48-character code set to facilitate indexing and listing. The title should be descriptive of the program since it is used for the key word index published in the Program Catalog.

1.4 SOURCE LANGUAGE

Indicate both the language in which the program is written and all the languages which may be used to call the routines.

1.5 OPERATING SYSTEM AND VERSION

If the program must run in conjunction with other software, which is not in the deck, it shall be noted here, as well as the last operating system it ran under.

1.6 COMPUTER AND CONFIGURATION

The computer and configuration for which the program has been written and checked out shall be given. If a special configuration, or equipment complement different from other installations is used, the particulars shall be stated. Program modifications to accommodate other equipment or configurations may also be given here.

1.7 LIBRARY MATERIALS

1.7.1 References

1.7.2 Flow Charts

A flow chart should be submitted whenever it is available. This is especially true for any substantial section of a submitted program which is machine coding. Large programs should have both general and detailed flow charts. The general flow chart consists of one block for each subroutine.

1.7.3 Sample Problem (sample input and output)

It is recommended that test data used and results obtained in checking the operation and accuracy of the routine be submitted.

1.7.4 Listing of Source Deck

1.7.5 Source Deck

1.7.6 Binary Deck

2.0 PUBLIC FILE

If the program is on a public file, please indicate.

3.0 PROGRAM AVAILABILITY BY:

If the program can be initiated in the batch mode or remote mode, or both, these boxes are checked.

4.0 ABSTRACT

All characters in the abstract shall be available in the basic 48-character code set to facilitate indexing and listing. The abstract should be no more than two short paragraphs and should contain the following information: Purpose, and
Program Type [subroutine, complete routine or system]

5.0 LIMITATIONS

Anything that the programmer and/or operator should keep in mind while using the routine should be given here. Please include any deviations from reference documentation in this section.

Examples: Handle up to 30 variables, do not step through routine, overflow not abnormal, routine destroys certain locations, and routine seizes control of buffers.

EXAMPLES OF

ABSTRACT SHEETS

ABSTRACT SHEET

IDENTIFICATION B2-INDU-ALOG10

DATE WRITTEN 1965

TITLE LOGARITHM TO BASE 10

SOURCE LANGUAGE COMPASS

OPERATING SYSTEM & VERSION OS-3 2.0

COMPUTER & CONFIGURATION CDC 3300

LIBRARY MATERIALS

- [X] **REFERENCE** COMPUTER SYSTEMS FORTRAN LIBRARY FUNCTIONS (60138600) CDC PUB
- [ ] **FLOW CHARTS**
- [ ] **SAMPLE PROBLEM**
- [ ] **LISTING**
- [ ] **SOURCE DECK**
- [ ] **BINARY DECK**

[X] **PUBLIC FILE** *FORTRAN LIBRARY FUNCTION

PROGRAM AVAILABLE BY:

- [ ] **BATCH**
- [ ] **REMOTE TERMINAL**

ABSTRACT:

To determine the common logarithm of a floating point argument X.

LIMITATIONS:

ABSTRACT SHEET

IDENTIFICATION G7-INDU-BMD01M

DATE WRITTEN July 1, 1968

TITLE PRINCIPAL COMPONENT ANALYSIS

SOURCE LANGUAGE FORTRAN IV

OPERATING SYSTEM & VERSION OS-3 2.0

COMPUTER & CONFIGURATION CDC 3300

LIBRARY MATERIALS

- [X] **REFERENCE** OSU Statistical Analysis Program Library
- [X] **FLOW CHARTS**
- [X] **SAMPLE PROBLEM**
- [X] **LISTING**
- [X] **SOURCE DECK**
- [ ] **BINARY DECK**

[X] **PUBLIC FILE**

PROGRAM AVAILABLE BY:

- [X] **BATCH**
- [X] **REMOTE TERMINAL**

ABSTRACT:

Computes the principal components of standardized data and rank orders each case by the size of each principal component separately.

LIMITATIONS:

This program will handle 25 variables and 160 cases.

ABSTRACT SHEET

IDENTIFICATION B4-CODA-SQRT

DATE WRITTEN Aug 1965

TITLE FLOATING POINT SQUARE ROOT

SOURCE LANGUAGE COMPASS

OPERATING SYSTEM & VERSION OS-3 2.0

COMPUTER & CONFIGURATION CDC 3300

LIBRARY MATERIALS

- [X] **REFERENCE** COMPUTER SYSTEMS LIBRARY ROUTINES (60058100)
- [X] **FLOW CHARTS** CDC PUB
- [ ] **SAMPLE PROBLEM**
- [X] **LISTING**
- [X] **SOURCE DECK**
- [ ] **BINARY DECK**

[X] **PUBLIC FILE** *FORTRAN LIBRARY FUNCTION

PROGRAM AVAILABLE BY:

- [ ] **BATCH**
- [ ] **REMOTE TERMINAL**

ABSTRACT:

Computes the square root of a floating point number.

LIMITATIONS:

ABSTRACT SHEET

IDENTIFICATION G2-OSU-STEPWISE

DATE WRITTEN July 1, 1968

TITLE STEPWISE MULTIPLE LINEAR REGRESSION ANALYSIS

SOURCE LANGUAGE FORTRAN IV

OPERATING SYSTEM & VERSION OS-3 2.0

COMPUTER & CONFIGURATION CDC 3300

LIBRARY MATERIALS

- [X] **REFERENCE** OSU Statistical Analysis Program Library
- [X] **FLOW CHARTS**
- [X] **SAMPLE PROBLEM**
- [X] **LISTING**
- [X] **SOURCE DECK**
- [ ] **BINARY DECK**

[X] **PUBLIC FILE**

PROGRAM AVAILABLE BY:

- [X] **BATCH**
- [X] **REMOTE TERMINAL**

ABSTRACT:

Computes a sequence of multiple linear regression equations in stepwise manner. At each step one variable is added to the regression equation. The variable added is the one which makes the greatest reduction in the error sum of squares. Equivalently it is the variable which has the highest partial correlation with the dependent variable partialed on the variables which have already been added, and equivalently it is the variable which, if it were added, would have the highest F value. In addition, variables can be forced into the regression equation and automatically removed when their F values become too low. Regression equations with or without the regression intercept may be selected.

LIMITATIONS:

This program will handle 50 variables.

ABSTRACT SHEET

IDENTIFICATION G4-ORSU-ANCOVAR1

DATE WRITTEN June 1, 1964

TITLE ANALYSIS OF COVARIANCE - COMPLETELY RANDOMIZED DESIGN, (ONE FACTOR)

SOURCE LANGUAGE FORTRAN 33

OPERATING SYSTEM & VERSION OS-3 2.0

COMPUTER & CONFIGURATION CDC 3300 - 4 tapes, 4 disk, 65K

LIBRARY MATERIALS

- ☐ **REFERENCE** OSU Statistical Analysis Program Library
- ☒ **FLOW CHARTS**
- ☒ **SAMPLE PROBLEM**
- ☒ **LISTING**
- ☒ **SOURCE DECK**
- ☐ **BINARY DECK**

☒ **PUBLIC FILE**

PROGRAM AVAILABLE BY:

- ☒ **BATCH**
- ☒ **REMOTE TERMINAL**

ABSTRACT:

Computes a single factor covariance table with means and adjusted means.

LIMITATIONS:

Handles up to 100 levels of the factor.

DOCUMENTATION FORMAT

Recommendations for Documentation Format (User need not follow exact order of this format, but should include items available).

6.0 USAGE

6.1 CALLING SEQUENCE OR CONTROL CARDS

For subroutine: Give the calling sequence which will call the routine. For each entry point, the calling sequence in each language which may call the routine should be given.

For complete routine: The format of all control cards should be given.

6.2 ARGUMENTS, PARAMETERS

A description of arguments and parameters in the calling sequence. This should include what they represent in the physical problem, mode of arithmetic, and any limitations on size. Also, a description of any assumptions made by the routine when it is called.

Examples: Locations of pointers, contents of tables, contents of system calls, status of input/output operations.

6.3 CORE REQUIREMENTS

6.3.1 Program and Unique Locations
This includes all space not listed in common.

6.3.2 Common

6.3.2 Common (continued)

Names of and the total number of common locations used in each routine. It may be desirable to give this information in a table form.

6.3.3 Temporary

The names of temporary storage and the size of each should be listed with the name of each subroutine which uses it. It should appropriately note if the temporary storage is included in unique or common. Again, a table may be preferable here.

6.4 TAPE AND DISK MOUNTINGS

6.4.1 List all tapes which must be mounted and the units on which they are mounted, including system tapes.

6.4.2 Output

Give unit numbers and names of output tapes.

6.5 FORMATS

A description of the format of all input or output data shall be included. That is, any information transmitted to or from an external device. If the meaning of the input and/or output is not self-evident, then it should be explained here.

6.6 ALARMS, ERROR RETURNS AND ERROR CODES

All alarms which may be returned to the user to give instructions on detecting problems should be described, the causes explained, and the action required of the programmer. The unit to which the alarm is sent, should be stated and the alarm should be given verbatim. Describe error returns and error codes as well as relevant conditions at time of occurrence.

6.7 TIMING

If a general equation for computation of the length of time cannot be given, then the time needed for executing a minimum, average, and maximum problem would be desirable. The author should give as much information as possible as to the size of the problem for which timing is given.

6.8 ACCURACY

The error bounds which may result from the operations performed by the routine.

6.9 SUBSIDIARY ROUTINES REQUIRED

A list of the following types of routines used by the program is useful:

A. Standard Library Routines, e.g. (EOFCHK)
B. Installation Dependent Routines
C. Other User Group Library Routines
D. Other Required Routines (must be attached)

7.0 METHOD OF ALGORITHM

A description of the mathematics. Algorithm and/or procedure.

8.0 LIBRARY MATERIALS

8.0.1 Flow Chart
8.0.2 Sample Problem (sample input and output)
8.0.3 Listing of Source Deck

EXAMPLE OF

DOCUMENTATION FORMAT

Analysis of Covariance

Completely Randomized Design (one factor)

(6.0) This program calculates entries for an Analysis of Covariance Table and a Table of Means.

(7.0) The Analysis of Covariance Table

Calculations for the total line:

degrees of freedom = n - 1

where n = the number of observations.

Sum of products:

$$X*X = \Sigma x^2 - \frac{(\Sigma x)^2}{n} \qquad (T_{xx})$$

$$X*Y = \Sigma yx - \frac{\Sigma x \Sigma y}{n} \qquad (T_{xy})$$

$$Y*Y = \Sigma y^2 - \frac{(\Sigma y)^2}{n} \qquad (T_{yy})$$

For the adjusted sum of squares section:

degrees of freedom = n - 2

$$\text{Sum of squares} = T_{yy} - \frac{(T_{xy})^2}{T_{xx}} \qquad (TSS)$$

Analysis of Covariance

(6.1) Completely Randomized Design (one factor)

(6.2) Card A

Header Card

Col 1-2	Levels of factor (number of groups)
Col 3-4	Input unit (if card reader, must be 60)
Col 5-6	Cycle code
	00 1 pass
	01 cycle again, read another header when done
Col 7-14	Factor ID (alpha)
Col 15-23	Variable x ID (alpha)
Col 23-30	Variable y ID (alpha)

(6.5) Card B

Format statement for the read statement

READ (IU, FRMT) IG, X, Y

Where IG is the level of factor 1

Will handle 40 levels, but dimension statement can be changed to accommodate more levels. Will make as many passes as needed through data, as requested in col 5-6.

Calculations for factor (group) line:

degrees of freedom = v - 1

where v = levels of factor.

$$X*X = \sum_{1}^{v} \frac{\left(\sum_{1}^{n_i} x_i\right)^2}{n_i} - \frac{(\Sigma x)^2}{n} \qquad (G_{xx})$$

$$X*Y = \sum_{1}^{v} \frac{\left(\sum_{1}^{n_i} x_i \sum_{1}^{n_i} y_i\right)}{n_i} - \frac{\Sigma x \Sigma y}{n} \qquad (G_{xy})$$

$$Y*Y = \sum_{1}^{v} \frac{\left(\sum_{1}^{n_i} y_i\right)^2}{n_i} - \frac{(\Sigma y)^2}{n} \qquad (G_{yy})$$

Calculations for the Error line:

degrees of freedom = n - v

$$X*X = T_{xx} - G_{xx} \qquad (E_{xx})$$

$$X*Y = T_{xy} - G_{xy} \qquad (E_{xy})$$

$$Y*Y = T_{yy} - G_{yy} \qquad (E_{yy})$$

For the adjusted sum of squares section:

$$\text{degrees of freedom} = r - v - 1 \qquad \text{(EDF)}$$

$$\text{sum of squares} = E_{yy} - \frac{(E_{xy})^2}{E_{xx}} \qquad \text{(ESS)}$$

$$\text{mean square} = \frac{ESS}{EDF}$$

Calculations for the factor adjusted for the average error:

$$\text{degrees of freedom} = v - 1$$

$$\text{sum of squares} = TSS - ESS \qquad \text{(ASS)}$$

$$\text{mean square} = \frac{ASS}{v-1} \qquad \text{(AMS)}$$

$$F \text{ statistic} = \frac{AMS}{EMS}$$

Table of Means:

This table gives the number of observations, means of the variables X and Y, and the adjusted mean Y for each level of the factor.

The means of X and Y are calculated:

$$\frac{\sum_{1}^{n_i} x_i}{n_i}, \quad \frac{\sum_{1}^{n_i} y_i}{n_i}, \qquad i = 1, \ldots, v$$

v = number of levels.

The adjusted mean Y is calculated:

$$\frac{\sum_{1}^{n_i} y_i}{n_i} - \frac{E_{xy}}{E_{xx}} \left(\frac{\sum_{1}^{n_i} x_i}{n_i} - \frac{\Sigma x}{n} \right)$$

This can be written as $\bar{y}' = y_i - b(\bar{x}_i - \bar{x})$. See p 484-487, Federer.

Deck Setup

1) Header Card A

(6.5) 2) Format statement Card B

3) Data (data input can be any input unit as specified by header Card A, Cols. 3-4, according to format described by card type B)

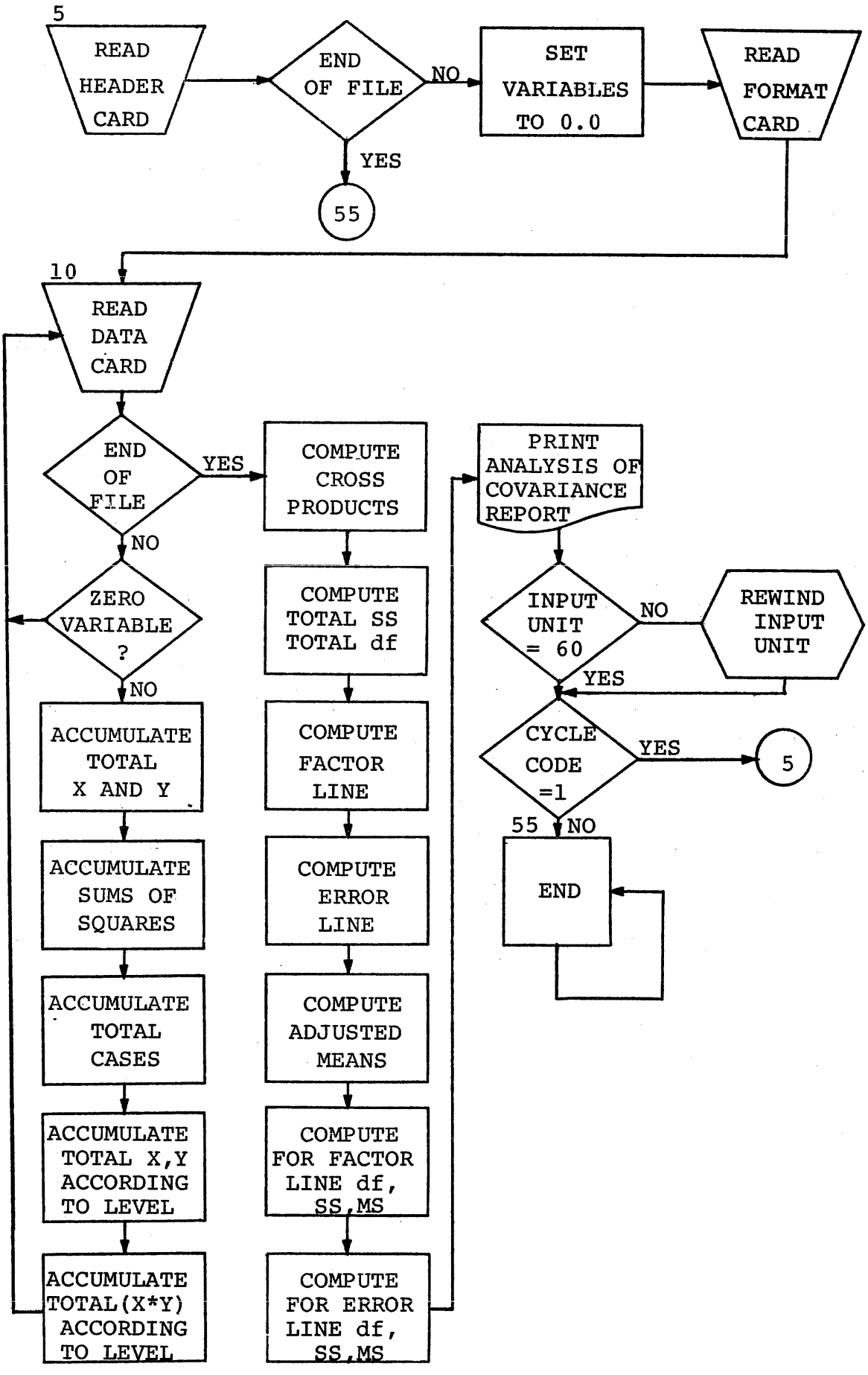
Repeat if desired

CORE REQUIREMENTS

(6.3) 22 quarter pages.

(6.7) Example program ran seven seconds.

(6.9) Uses EØFCKF function.


5
READ HEADER CARD
END OF FILE
NO
YES
55
SET VARIABLES TO 0.0
READ FORMAT CARD
10
READ DATA CARD
END OF FILE
YES
NO
ZERO VARIABLE ?
NO
ACCUMULATE TOTAL X AND Y
ACCUMULATE SUMS OF SQUARES
ACCUMULATE TOTAL CASES
ACCUMULATE TOTAL X,Y ACCORDING TO LEVEL
ACCUMULATE TOTAL(X*Y) ACCORDING TO LEVEL
COMPUTE CROSS PRODUCTS
COMPUTE TOTAL SS TOTAL df
COMPUTE FACTOR LINE
COMPUTE ERROR LINE
COMPUTE ADJUSTED MEANS
COMPUTE FOR FACTOR LINE df, SS, MS
COMPUTE FOR ERROR LINE df, SS, MS
PRINT ANALYSIS OF COVARIANCE REPORT
INPUT UNIT = 60
NO
REWIND INPUT UNIT
YES
CYCLE CODE =1
YES
5
55
NO
END

(8.0.2 (Input))

One Factor Analysis of Corvariance

```
066000 TREAT.    X       Y
(I1,1X,F3.1,1X,F3.0)
1  82 287
1  94 290
1  77 254
1  85 307
2  82 271
2  60 209
2  91 243
2 101 348
3  68 234
3  70 210
3  97 286
3  99 371
4  57 189
4  55 205
4 102 312
4 103 375
5  61 210
5  70 276
5  87 279
5  81 344
6  76 222
6 101 301
6  90 238
6 105 357
```

ANALYSIS OF COVARIANCE

FACTOR X IS	X	FACTOR Y IS	Y					
SOURCE	DF	X*X	X*Y	Y*Y	DF	SS	MS	F
TOTAL	23	57.258333	1664.949999	72034.500000	22	23621.311226		
TREAT.	5	7.393333	21.849998	749.500000				
ERROR	18	49.865000	1643.100000	71285.000000	17	17143.265100	1008.427359	
TREAT.	ADJUSTED FOR AVERAGE ERROR				5	6478.046125	1295.609225	1.285

TREAT.	OBS.	MEAN X	MEAN Y	ADJ. MEAN Y
1	4	8.45000	284.50000	279.83195
2	4	8.35000	267.75000	266.37704
3	4	8.35000	275.25000	273.87704
4	4	7.92500	270.25000	282.88120
5	4	7.47500	277.25000	304.70914
6	4	9.30000	279.50000	246.82362

```
      PROGRAM ANCCOV1
      DIMENSION SXG(40),SYG(40),SXYG(40),XN(40),FRMT(10)
      DIMENSION XMN(40),YMN(40),Y1MN(40)
  101 FORMAT(3I2,3A8)
  102 FORMAT(10A8)
  200 FORMAT(1H1,47X,22HANALYSIS OF COVARIANCE)
  201 FORMAT(1HO,6HSOURCE,9X,2HDF,10X,3HX*X,15X,3HX*Y,15X,3HY*Y,12X,2HDF
     112X,2HSS,14X,2HMS,18X,1HF)
  202 FORMAT(1HO,5HTOTAL,6X,F6.0,3(3X,F15.6),3X,F6.0,3X,F15.6)
  203 FORMAT(1HO,A8,3X,F6.0,3(3X,F15.6))
  204 FORMAT(1HO,5HERROR,6X,F6.0,3(3X,F15.6),3X,F6.0,3X,F15.6,3X,F15.6)
  205 FORMAT(1HO,A8,27H ADJUSTED FOR AVERAGE ERROR,39X,F6.0,2(3X,F15.6)
     1,3X,F15.3,///)
  206 FORMAT(1HO,I6,3X,F6.0,3(F15.5,3X))
  207 FORMAT(1H-,12HFACTOR X IS ,A8,5X,12HFACTOR Y IS ,A8)
  208 FORMAT(1HO,A8,7H   OBS.,6X,6HMEAN X,14X,6HMEAN Y,10X,11HADJ. MEAN
     1Y)
C*******************************************************************************
C          BEGIN PROGRAM
C*******************************************************************************
C    *****  READ HEADER CARD  *****                                             *
    5 READ(60,101)NG,IU,NP,GID,XID,YID                                          *
      GO TO (55,2)ECFCKF(60)                                                    *
    2 DO 1 I=1,40                                                               *
    1 SXG(I)=SYG(I)=SXYG(I)=XN(I)=0.0                                           *
      SXN=SX=SY=SXY=SX2=SY2=0.0                                                 *
      IG1=I=1                                                                   *
C    *****  READ FORMAT CARD  *****                                             *
      READ(60,102)FRMT                                                          *
C*******************************************************************************
C          BEGIN MAIN LINE
C*******************************************************************************
   10 READ(IU,FRMT)IG,X,Y                                                       *
      GO TO (35,16)ECFCKF(IU)                                                   *
   16 IF(X.EQ.0.OR.Y.EQ.0)10,15                                                 *
C    *****  ACCUMULATE TOTAL  X  AND  Y  *****                                  *
   15 SX=SX+X                                                                   *
      SY=SY+Y                                                                   *
C    *****  ACCUMULATE TOTAL SUM OF SQUARES  *****                              *
      SX2=SX2+X*X                                                               *
      SY2=SY2+Y*Y                                                               *
      SXY=SXY+X*Y                                                               *
C    *****  ACCUMULATE TOTAL CASES  *****                                       *
      SXN=SXN+1.                                                                *
C    *****  ACCUMULATE TOTAL X AND Y  BY LEVEL  *****                           *
      SXG(IG)=SXG(IG)+X                                                         *
      SYG(IG)=SYG(IG)+Y                                                         *
C    *****  ACCUMULATE TOTAL (X*Y) BY LEVEL  *****                              *
      SXYG(IG)=SXYG(IG)+X*Y                                                     *
      XN(IG)=XN(IG)+1.                                                          *
      GO TO 10                                                                  *
C*******************************************************************************
C          CALCULATIONS AT END OF DATA INPUT
C*******************************************************************************
```

```
C   *****  SUM OF PRODUCTS  *****
   35 P1=SX*SX/SXN
      P2=SY*SY/SXN
      P3=SX*SY/SXN
      TXX=SX2-P1
      TYY=SY2-P2
      TXY=SXY-P3
C   *****  DEGREES OF FREEDOM  *****
      RXN=SXN-1.
      RXN1=SXN-2.
C   *****  ADJUSTED TOTAL SUMS OF SQUARES  *****
      TYY1=TYY-TXY*TXY/TXX
      SGXX=SGYY=SGXY=0.0
C   *****  COMPUTE FACTOR LINE  *****
      DO 40 I=1,NG
      XMN(I)=SXG(I)/XN(I)
      YMN(I)=SYG(I)/XN(I)
      SGXX=SGXX+SXG(I)*SXG(I)/XN(I)
      SGYY=SGYY+SYG(I)*SYG(I)/XN(I)
   40 SGXY=SGXY+SXG(I)*SYG(I)/XN(I)
C   *****  COMPUTE ERROR LINE  *****
      GXX=SGXX-P1
      GYY=SGYY-P2
      GXY=SGXY-P3
      EXX=TXX-GXX
      EYY=TYY-GYY
      EXY=TXY-GXY
C   *****  COMPUTE ADJUSTED MEANS  *****
      DO 60 I=1,NG
   60 Y1MN(I)=YMN(I)-EXY*(XMN(I)-SX/SXN)/EXX
C   *****  COMPUTE DEG. OF FREEDOM, ADJ. SUM OF SQRS.-ERROR  *****
C   *****  ADJ. SUM OF SQRS.-GROUP, MEAN SQ.-ERROR, MEAN SQ.-GROUP
C   *****  F-RATIO  *****
      XN1=NG-1
      VXN=SXN-NG
      VXN1=VXN-1.
      EYY1=EYY-EXY*EXY/EXX
      GYY1=TYY1-EYY1
      EMS=EYY1/VXN1
      GMS=GYY1/XN1
      F=GMS/EMS
C*****************************************************************************
C          PRINT ANALYSIS OF COVARIANCE REPORT
C*****************************************************************************
      WRITE(61,200)
      WRITE(61,207)XID,YID
      WRITE(61,201)
      WRITE(61,202)RXN,TXX,TXY,TYY,RXN1,TYY1
      WRITE(61,203)GID,XN1,GXX,GXY,GYY
      WRITE(61,204)VXN,EXX,EXY,EYY,VXN1,EYY1,EMS
      WRITE(61,205)GID,XN1,GYY1,GMS,F
      WRITE(61,208) GID
      DO 65 I=1,NG
   65 WRITE(61,206)I,XN(I),XMN(I),YMN(I),Y1MN(I)
```

FORTRAN (1.1)/MASTER 06/21/68

```
C*******************************************************************************
C          END OF JOB
C*******************************************************************************
      IF(IU.NE.60)45,50                                                        *
   45 REWIND IU                                                                *
   50 IF(NP.EQ.1)5,55                                                          *
   55 CONTINUE                                                                 *
      END
```

FORTRAN DIAGNOSTIC RESULTS FOR ANOCOV1

NO ERRORS

ANOCOV1 P 02257 C 00000 D 00000
FREQ.LGO