Factor Analysis By The Centroid Method 1620-6.0.053

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COMMON USERS GROUP PROGRAM REVIEW AND EVALUATION

(fill out in typewriter, ink or pencil)

Program No._____ Date_____

Program Name:_____

1. Does the abstract adequately describe what the program is and what it does? Yes____ No____
   Comment_____

2. Does the program do what the abstract says? Yes____ No____
   Comment_____

3. Is the description clear, understandable, and adequate? Yes____ No____
   Comment_____

4. Are the Operating Instructions understandable and in sufficient detail? Yes____ No____
   Comment_____
   Are the Sense Switch options adequately described (if applicable)? Yes____ No____
   Are the mnemonic labels identified or sufficiently understandable? Yes____ No____
   Comment_____

5. Does the source program compile satisfactorily (if applicable)? Yes____ No____
   Comment_____

6. Does the object program run satisfactorily? Yes____ No____
   Comment_____

7. Number of test cases run_____. Are any restrictions as to data, size, range, etc. covered adequately in description? Yes____ No____
   Comment_____

8. Does the Program meet the minimal standards of COMMON? Yes____ No____
   Comment_____

9. Were all necessary parts of the program received? Yes____ No____
   Comment_____

10. Please list on the back any suggestions to improve the usefulness of the program. These will be passed onto the author for his consideration.

Please return to:

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Your Name _____
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2/2/67

Factor Analysis by the Centroid

Technique

William E. Milner

North Texas State University

May 10, 1962

6.0 Statistical Program

Modifications or revisions to this program, as they occur, will be announced in the appropriate Catalog of Programs for IBM Data Processing Systems. When such an announcement occurs, users should order a complete new program from the Program Information Department.

Table of Contents

Program Manual

I. Title: Factor Analysis by Centroid-NT0068

II. Description of Program

A. Results

The program output is the factor loadings associated with the raw data. A first approximation is typed first and then as a second pass a refined set of factor loadings, based on the first approximations, are output.

B. Method of Computation

Thurston's method of centroid

III. Input/Output

Input Format

Card 1: N1 blank N2

where N1 = the number of observed variables

N2 = the number of observations

Card 2: R_{ij} ,i=1, j=1

Card 3: R_{12}

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Output Format

The factor loadings matrix in row order

The H^2 as described by Thurston in row order.

Input

4 ← No of observed variables

15 ← No of observations 4

.00000000	r_{11}
1.0000005	r_{12}
.59229011	r_{13}
.26647283	r_{14}
1.0000005	r_{21}
.00000000	r_{22}
.59228991	r_{23}
.26647288	r_{24}
.59229011	r_{31}
.59228991	r_{32}
.00000000	r_{33}
.50432403	r_{34}
.26647283	r_{41}
.26647288	r_{42}
.50432403	r_{43}
.00000000	r_{44}

Simple Correlation Coefficient Matrix in Row order with Zero diagonal

Output

5

First Approximations

4 ← No of factor loadings to extract
1000. ← Amount of communality to extract (1000. extracts all)

Check sums (should be #)

3.0887400 3.0887401
.80985925 ← Per Cent of Communality remaining
.92554368 1 1
.92554362 2 1
.73855165 3 1
.49910113 4 1 } Factor loadings with Row Col index

1.5579575 1.5579574
.2009290
.40153558 1 2
.40153558 2 2
-.29138646 3 2
-.46349996 4 2

.43572558 .43572563
1.7518527E-02
9.8581944E-02 1 3
9.8581026E-02 2 3
-.17565266 3 3
6.2909955E-02 4 3

.39640585 .39640586
1.4871618E-02
.12587771 1 4
-.15241923 2 4
-5.9054434E-02 3 4
5.9054485E-02 4 4

Rotated Matrix

3.1103089 3.1103090
.79051716
.93308693 1 1
.93546165 2 1
.75671253 3 1
.48504791 4 1

1.5595840 1.5595839
.19066207
.39315617 1 2
.39578558 2 2
-.32312368 3 2
-.44751867 4 2

.39230134 .39230141
1.6934196E-02
.20486288 1 3
-8.7923798E-02 2 3
-5.4852848E-02 3 3
4.4661832E-02 4 3

.38180769 .38180773
1.3116447E-02
-4.6836084E-02 1 4
-.15396701 2 4
9.7193927E-02 3 4
8.3810681E-02 4 4

1.0434253
1.0508116
.66470587
.47137924 } H^2
STOP

6

8

V. Operating Instructions

1) Set tabs and maragin as for standard FORTRAN

2) Ready card reader with program deck followed by data cards

3) Depress reset and load, when the "Load Data" message is typed depress start on the 1620

4) The program will read the first data card and stop ready to accept two pieces of data from the typewriter. These are

   KAP the number of factors to extract up to 12

   Data the amount of comunality to extract, this is rarely known and a value of 1000. is adequate to extract all.

5) The program will then read the balance of the data cards and will output the first approximation for the factor loadings. After typing these the program will attempt to read again. If a refined set of loadings and the H^2 are desired place the entire data deck in the reader and hit start.


```
C     FACTOR ANALYSIS, CENTROID
C     INPUT FOR THIS PGM IS OUTPUT OF THE SIMPLE CORRELATION
C     ROUTINE BY THE SAME AUTHOR. ALL DATA CARDS WILL BE READ
C     AND THE PGM WILL COMPUTE AND OUTPUT THE FIRST APPROX.
C     THE FACTOR LOADINGS,THE PGM WILL THEN TRY TO READ THE
C     DATA AGAIN. AT THIS TIME THE ORIGINAL DATA DECK SHOULD BE
C     ENTERED AGAIN AND THE OUTPUT WILL BE A REFINED SET OF Factor Loadings
C     GENE MILNER                                          & The H²
C     NORTH TEXAS STATE UNIVERSITY
      DIMENSION R(15,15),C(15,12),SUMI(15),H2(15)
    1 READ,N1,N2
      ACCEPT,KAP,DATA
    2 DO 3 I=1,N1
    3 H2(I)=0.
      MAP=1
      MIG=1
      H=0.
      MUG=1
      SUMH=0.
      DO 4 I=1,N1                    DO 4 I=1,N1
      DO 4 J=1,N1
    4 READ,R(I,J)
  500 K=1
      DO 510 I=1,N1
      DO 510 J=1,12
  510 C(I,J)=1.0
  525 L=1
  530 DO 5 I=1,N1
    5 SUMI(I)=0.
      SUMC=0.
      SUMC2=0.
      DO 6 I=1,N1
      DO 6 J=1,N1
    6 SUMI(I)=SUMI(I)+R(I,J)
      T=0.
      DO 7 I=1,N1
    7 T=T+SUMI(I)
      N4=N1+1
      IF(L-1)725,590,725
  590 DO 8 I=1,N1
      IF (SUMI(I))610,8,8
    8 CONTINUE
      GO TO 670
  610 GA=9999.
      DO 9 I=1,N4
      IF(SUMI(I) - GA) 620,9,9
  620 GA=SUMI(I)
      JIG=I
    9 CONTINUE
      I=JIG
      DO 10 J=1,N1
   10 R(I,J)=-R(I,J)
      J=JIG
      DO 11 I=1,N1
   11 R(I,J)=-R(I,J)
      C(JIG,K)=-C(JIG,K)
      GO TO 530
  670 GO TO (671,701),MUG
```

```
671 DO 700 I=1,N1
    RAG=0.
    DO 690 J=1,N1
    IF(ABS(R(I,J))-RAG)690,690,685
685 RAG=ABS(R(I,J))
690 CONTINUE
700 R(I,I)=RAG
701 MUG=1
    GO TO(705,720),MAP
705 MAP=2
    DO 715 I=1,N1
715 H=H+R(I,I)
720 L=2
    GO TO 530
725 IF(L-2)730,770,730
730 DO 740 I=1,N1
735 IF(SUMI(I))750,740,750
740 CONTINUE
    GO TO 755
750 CONTINUE
    GO TO 740
755 DO 765 I=1,N1
765 R(I,I)=0.
    GO TO 525
770 RTT=SQR(T)
    DO 805 I=1,N1
    TEMP=SUMI(I)/RTT
    IF(C(I,K))785,790,790
785 IF(TEMP)795,800,800
790 IF(TEMP)800,795,795
795 C(I,K)=TEMP
    GO TO 805
800 C(I,K)=-TEMP
805 CONTINUE
    DO 815 I=1,N1
    SUMC=SUMC+ABS(C(I,K))
815 SUMC2=SUMC2+C(I,K)*C(I,K)
    IF(SUMC-RTT)820,825,820
820 TYPE,SUMC,RTT
825 PHK=SUMC2/H
    SUMH=SUMH+PHK
    TYPE,PHK
    DO 12 I=1,N1
    TYPE,C(I,K),I,K
 12 CONTINUE
    DO 835 I=1,N1
    DO 835 J=1,N1
835 R(I,J)=R(I,J)-ABS(C(I,K)*C(J,K))
    L=3
    IF(SUMH-DATA)840,840,855
840 IF(KAP-K)855,855,850
850 K=K+1
    GO TO 530
855 GO TO(856,900),MIG
856 DO 865 I=1,N1
860 DO 865 J=1,K
865 H2(I)=H2(I)+C(I,J)*C(I,J)
    READ,N1,N2
    DO 13 I=1,N1
    DO 13 J=1,N1
    READ,R(I,J)
 13 CONTINUE
```



```
    DO 885 I=1,N1
885 R(I,I)=H2(I)
    MUG=2
    MAP=1
    H=0.
    SUMH=0.
    MIG=2
    GO TO 500
900 CONTINUE
    DO 16 I=1,N1
    TYPE,H2(I)
 16 CONTINUE
    STOP
    END
```