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| DECUS NO. | 8-322 |
| TITLE | CCMP (CORRELATION OF COMPONENTS)<br>and<br>CVAL (COMPUTES VALUES OF PRINCIPAL COMPONENTS) |
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| SOURCE LANGUAGE | FORTRAN D |

CCMP (CORRELATION OF COMPONENTS)
and
CVAL (COMPUTES VALUES OF PRINCIPAL COMPONENTS)

## CCMP - CORRELATE COMPONENTS

### SUMMARY

This program calculates the correlations between two sets of components to produce a rectangular matrix of correlation coefficients. It can also be used to correlate two sets of variables for which the correlations within each set have already been calculated or are of no interest.

### TAPES REQUIRED

Form of program tape - The program is written in the PDP-8 FORTRAN-D language, and is in the source language.

Form of data tape

(a) The two sets of components should appear on separate tapes in each case as a rectangular matrix of sets and variables, i.e., with the individual sets in the rows and the variables in the columns.

(b) Summaries of the two sets of component values should be computed by means of the MMMS program and then merged onto a single tape by means of the EDIT facility. The summary of the tape with the smallest number of variables should be placed first on this tape. It is important that all . and ! signs are edited out of this tape.

### METHOD OF OPERATION

Normal for FORTRAN-D. The data tape with the smallest number of variables should be placed in the low-speed tape-reader and the data tape with the largest number of variables placed in the high-speed reader, before continuing after the teletype has typed READY. The program will request the entry of the numbers of X and Y variables and the number of sets, and these should be entered on the teletype, each number being terminated by either space of new line. After both data tapes have been read, the program will pause, and the summary data tape should then be placed in the high-speed reader before continuing.

### OUTPUT

The program prints the coefficients of the correlations between the two sets of components or variables.

### STORAGE AND LIMITATIONS

Normal for FORTRAN-D. The numbers of X and Y variables are limited to 12 each, but there is no limit on the number of sets.

```
L

C          PROGRAM TO CORRELATE COMPONENTS CCMP
           DIMENSION SX(12),X(12),SXY(144),SY(12),Y(12)
           TYPE 501
501        FORMAT (/,"ENTER NO OF X,Y VARIABLES AND SETS",/)
           ACCEPT 5,L,M,N
5          FORMAT (I,I,I)
           DO 100 I=1,12
           SX(I)=0.0
           SY(I)=0.0
100        CONTINUE
           DO 99 I=1,144
           SXY(I)=0.0
99         CONTINUE
           DO 16 I=1,N
           DO 20 J=1,L
           READ 1,105,X(J)
           SX(J)=SX(J)+X(J)
20         CONTINUE
           DO 21 J=1,M
           READ 2,105,Y(J)
           SY(J)=SY(J)+Y(J)
21         CONTINUE
105        FORMAT (E)
           DO 16 J=1,L
           DO 16 K=1,M
           KK=K+M*(J-1)
           SXY(KK)=SXY(KK)+X(J)*Y(K)
16         CONTINUE
           EN=N
           DO 30 I=1,L
           DO 30 J=1,M
           K=J+M*(I-1)
           SXY(K)=SXY(K)-SX(I)*SY(J)/EN)/(EN-1.0)
30         CONTINUE
           PAUSE
           DO 35 I=1,L
           READ 2,104,NO,XMIN,SX(I),XMAX,X(I)
35         CONTINUE
           DO 36 I=1,M
           READ 2,104,NO,XMIN,SY(I),XMAX,Y(I)
36         CONTINUE
           DO 60 I=1,L
           TYPE 106
106        FORMAT (/)
           DO 60 J=1,M
           K=J+M*(I-1)
```

2

```
          SXY(K)=SXY(K)/(X(I)*Y(J) )
          WRITE 1,105,SXY(K)
60        CONTINUE
104       FORMAT (I, E, E, E, E)
          STOP
          END

*
```

3

# CVAL – COMPUTE VALUES OF PRINCIPAL COMPONENTS

## SUMMARY

This program computes the values of the first n principal components for each of the original data points of the data matrix. It may also be used to compute the values of canonical variates.

## TAPES REQUIRED

<u>Form of program tape</u> – The program is written in the PDP-8 FORTRAN-D language, and is in the source language.

<u>Form of data tape</u> – The data tape should contain, first, the means and standard deviations of the original variables included in the data matrix, and then the vectors for as many components as are required. These vectors should then be followed by the original data matrix. This data tape can readily be compiled from the results of the CORR and EIG programs, together with the original data matrix, using the EDIT facility.

## OPERATING INSTRUCTIONS

```
        .FORT                   Source program in high-speed reader
        *OUT-S:CVAL
        *
        *IN-R:
        * ↑
        *                       Data tape in high-speed reader
        *READY
```

The program will pause for the entry of the number of original variables, the number of components, and the number of data sets (points). These should be entered in succession and terminated by "Return". If an output tape is required, switch on the low-speed punch before typing "Return".

If the program has already been compiled onto the disk, it may be called into store as follows:

```
        .FOSL
        *IN-S:CVAL
        *
        *OPT−
        * ↑                     Data tape in high-speed reader
        *READY
        ↑
```

The operation of the program then follows as usual.

## OUTPUT

The program prints the values of the first n components. An output tape, produced simultaneously, is suitable for input to the NNAN program.

## STORAGE

Normal for FORTRAN-D.

For the 4K version, the number of original variables and the number of components must not exceed 12. The number of original variables times the number of sets must not exceed 144.

## METHOD

The component vectors are standardized before computing the component values from the original data, which are themselves standardized on input.

```
C          PROGRAM TO COMPUTE COMPONENT VALUES
           DIMENSION  X(20),SD(20),R(100),V(20)
           ACCEPT 100,N1,N2,N
100        FORMAT (I,I,I)
           DO 10 I=1,N1
           READ 2,101,X(I),SD(I)
10         CONTINUE
           NT=N1*N2
           DO 11 I=1,NT
           READ 2,101,R(I)
11         CONTINUE
101        FORMAT (E,E)
           K=1
           DO 12 I=1,N2
           V(I)=0.0
           DO 13 J=1,N1
           V(I)=V(I)+R(K)*R(K)
           K=K+1
13         CONTINUE
           V(I)=SQTF(V(I) )
12         CONTINUE
           K=1
           DO 15 J=1,N2
           DO 14 I=1,N1
4          R(K)=R(K)/V(J)
           K=K+1
14         CONTINUE
15         CONTINUE
           DO 16 I=1,N
           L=0
           TYPE 103
103        FORMAT (/)
           DO 17 (J=1,N1
           READ 2,101,V(J)
           V(J)=(V(J)-X(J) )/SD(J)
17         CONTINUE
           K=1
           DO 19 M=1,N2
7          ACC=0.0
           DO 18 J=1,N1
           ACC=ACC+V(J)*R(K)
           K=K+1
18         CONTINUE
           TYPE 102,ACC
102        FORMAT (E)
           L=L+1
           IF (L-4) 19,20,20
```

```
20      L=Ø
        TYPE 1Ø3
19      CONTINUE
16      CONTINUE
        END
```

*

```
L
C       PROGRAM TO COMPUTE COMPONENT VALUES
        DIMENSION X(12), SD(12), R(144), V(12)
        ACCEPT 1ØØ, N1, N2, N
1ØØ     FORMAT (I, I, I)
        DO 1Ø I=1, N1
        READ 2, 1Ø1, X(I), SD(I)
1Ø      CONTINUE
        NT=N1*N2
        DO 11 I=1, NT
        READ 2, 1Ø1, R(I)
11      CONTINUE
1Ø1     FORMAT (E, E)
        K=1
        DO 12 I=1, N2
        V(I)=Ø.Ø
        DO 13 J=1, N1
        V(I)=V(I)+R(K)*R(K)
        K=K+1
13      CONTINUE
        V(I)=SQTF(V(I) )
12      CONTINUE
        K=1
        DO 15 J=1, N2
        DO 14 I=1, N1
4       R(K)=R(K)/V(J)
        K=K+1
14      CONTINUE
15      CONTINUE
        DO 16 I=1, N
        L=Ø
        TYPE 1Ø3
```

```
1Ø3      FORMAT (/)
         DO 17  J=1, N1
         READ 2, 1Ø1, V(J)
         V(J)=(V(J)- X(J) )/SD(J)
17       CONTINUE
         K=1
         DO 19  M=1, N2
7        ACC=Ø.Ø
         DO 18  J=1, N1
         ACC=ACC+V(J)*R(K)
         K=K+1
18       CONTINUE
         TYPE 1Ø2, ACC
1Ø2      FORMAT (E)
         L=L+1
         IF (L-4)  19, 2Ø, 2Ø
2Ø       L=Ø
         TYPE 1Ø3
19       CONTINUE
16       CONTINUE
         END


*
```