```
C  **  MULTIPLE  REGRESSION  **          *P.R. REDDY*
      INTEGER HH,MM,SS
      DATA HH,MM,SS/3*0/
      LOGICAL FIRST
      DATA FIRST/.FALSE./
      LOGICAL SECN
      DATA SECN/.FALSE./
      DIMENSION S(16,16),SI(16,16),X(16),Y(30),SY(17,30),ZX(16),ZY(30)
      DIMENSION CM(16,16),          CY(17,30),PG(16),B(16),ED(16,16)
      DIMENSION SERR(16),TVAL(16)
      DIMENSION VC(17,17),DD(17,17)
      INTEGER CCOD,SN,SCOD,LCOD,TIND,CCCOD,PCF,NERR,CF,PG,SRN
      INTEGER GP
      LOGICAL LIND
      DATA CCCOD/'MULT'/,PCF/0/,LIND/.FALSE./,NERR/0/
      DATA S/256*0.0/,X/16*0.0/,SY/510*0.0/,Y/30*0.0/
      READ (5,10)CCOD,PG,SN,K1,IK,SCOD,LCOD,TIND
10    FORMAT(A4,2I1,2I2,2I3,I1)
      IF(CCOD.NE.CCCOD.OR.K1.LT.1.OR.IK.LT.1) STOP 111
      K=K1+1
21    N=0
      IF(FIRST)GOTO 311
      CALL CLOCK(HH,MM,SS)
      WRITE(6,9)HH,MM,SS
9     FORMAT('0TIME =',3I4)
311   CONTINUE
C
C
23    CONTINUE
      IF(SN.EQ.2)GOTO 25
      READ(5,1,END=200,ERR=222)SRN,NC1,CF,(ZX(I),I=1,K1)
1     FORMAT (I3,I1,1X,I1,3X,16F2.0)
      GOTO 26
25    READ(5,2,END=200,ERR=222)SRN,NC1,CF,(ZX(I),I=1,K1)
2     FORMAT (I3,I1,1X,I1,37X,15F2.0)
26    CONTINUE
      IF(SRN.EQ.999)GOTO 35
      READ(5,11,END=200,ERR=222)ISRN,NC2,CF,GP,(ZY(I),I=1,IK)
11    FORMAT(I3,I1,2X,I1,I1,3X,10(F1.0,F1.0,F2.0))
      IF(NC1.NE.1.OR.NC2.NE.2.OR.SRN.NE.ISRN.OR.GP.NE.PG)GOTO 230
      IF(CF.LT.SCOD)GOTO 23
      IF(CF.GT.LCOD)GOTO 35
      IF(CF.EQ.PCF)GOTO 30
      IF(TIND.EQ.1)GOTO 34
20    PCF=CF
30    N=N+1
      IF(SECN)GOTO 3001
      SECN=.TRUE.
      WRITE(6,12)SRN,NC1,CF,(ZX(I),I=1,K1)
12    FORMAT('0',I4,I2,I4,16F7.2)
      WRITE(6,13)ISRN,NC2,CF,(ZY(I),I=1,IK)
13    FORMAT(' ',I3,I2,I3,30F4.1)
3001  CONTINUE
      DO 32 L=1,IK
      Y(L)=Y(L)*ZY(L)
      DO 31 I=1,K1
31    SY(I,L)=SY(I,L)+ZY(L)*ZX(I)
32    SY(K,L)=SY(K,L)+ZY(L)*ZY(L)
      DO 33 I=1,K1
      X(I)=X(I)+ZX(I)
```

```
      DO 33 J=I,K1
33    S(J,I)=S(J,I)+ZX(I)*ZX(J)
      GOTO 23
C
C
34    IF(LIND)GOTO 35
      LINC=.TRUE.
      GOTO 28
C
C
C
C  PROCESS THE TABLES
35    AN=N
      LL=0
C  ***********************************************************************
      IF(FIRST)GOTO 312
      CALL CLOCK(HH,MM,SS)
      WRITE(6,9)HH,MM,SS
312   CONTINUE
      DO 38 I=1,K1
38    X(I)=X(I)/AN
C  FORM THE CORRECTED SP MATRIX IN S AND MOVE IT TO SI
      DO 40 I=1,K1
      DO 40 J=I,K1
      S(J,I)=S(J,I)-AN*X(I)*X(J)
      VC(J,I)=S(J,I)/AN
      SI(I,J)=S(J,I)
40    SI(J,I)=S(J,I)
      DO 42 L=1,IK
42    Y(L)=Y(L)/AN
      DO 45 L=1,IK
      DO 44 I=1,K1
44    SY(I,L)=SY(I,L)-AN*Y(L)*X(I)
45    SY(K,L)=SY(K,L)-AN*Y(L)*Y(L)
C
C
C  OBTAIN THE INVERSE OF CORRECTED SP MATRIX 'S' IN 'SI'
      DO 59 L=1,K1
      C=SI(L,L)
      SI(L,L)=1.0
      DO 52 J=1,K1
52    SI(L,J)=SI(L,J)/C
      DO 58 I=1,K1
      IF(I-L)54,58,54
54    C=SI(I,L)
      SI(I,L)=0.0
      DO 56 J=1,K1
56    SI(I,J)=SI(I,J)-C*SI(L,J)
58    CONTINUE
59    CONTINUE
C
C
C  FORM THE CORRELATION MATRIX IN 'CM' FOR INDPENDANT VARIABLES
      DO 67 I=1,K1
      DO 67 J=1,I
      C2=S(I,I)*S(J,J)
      C1=S(I,J)*S(I,J)/C2
      CM(I,J)=SQRT(C1)
      IF(S(I,J))66,67,67
66    CM(I,J)=-CM(I,J)
67    CONTINUE
```

```
C
C  FORM THE CORRELATIONS BETWEEN INDEPENDANT & DEPENDANT VARIABLES IN CY
      DO 72 L=1,IK
      DO 70 I=1,K1
      C2=SY(I,I)*SY(K,L)
      C1=SY(I,L)*SY(I,L)/C2
      CY(I,L)=SQRT(C1)
      IF(SY(I,L))69,70,70
69    CY(I,L)=-CY(I,L)
70    CONTINUE
72    CY(K,L)=1.0
C
C
C  PRINT RESULTS FOR EACH DEPENDANT VARIABLE
77    LL=LL+1
C  **********************************************************************
      IF(FIRST)GOTO 315
      CALL CLOCK(HH,MM,SS)
      WRITE(6,9)HH,MM,SS
315   CONTINUE
      WRITE(6,601)PG,SN,LL,PCF,N,K1
601   FORMAT(' ',10X,'PRODUCT GROUP =',I3,5X,'IND. VARIABLES SET NO. =',
     1I3,5X,'DEPENDANT VARIABLE NO. =',I3/' ',10X,18('='),
     2 5X,27('='),5X,27('=')//' ',
     310X,'DATA FOR =',I4,5X,'SAMPLE SIZE =',I4,5X,
     4'IND. VARIABLES =',I4//' ',25X,'MEANS')
      WRITE(6,606)(X(I),I=1,K1),Y(LL)
606   FORMAT(' ',17F7.2)
      WRITE(6,607)
607   FORMAT('0',25X,'VARIANCE COVARIANCE MATRIX')
      DO 78 J=1,K
78    VC(K,J)=SY(J,LL)/AN
      DO 80 I=1,K
80    WRITE(6,608)(VC(I,J),J=1,I)
608   FORMAT('0',10F12.2/' ',10F12.2)
      WRITE(6,609)
609   FORMAT('0',25X,'CORRELATION MATRIX')
      DO 82 I=1,K1
82    WRITE(6,610)(CM(I,J),J=1,I)
610   FORMAT('0',17(1X,F6.3))
      WRITE(6,610)(CY(J,LL),J=1,K)
C
C
C  MOVE THE CORRELATION MATRIX FROM CM & CY TO CI AND OBTAIN INVERSE #CI
      DO 86 I=1,K1
      DO 86 J=1,I
      DD(I,J)=CM(I,J)
86    DD(J,I)=CM(I,J)
      DO 88 I=1,K
      DD(K,I)=CY(I,LL)
88    DD(I,K)=CY(I,LL)
C
C  FIND THE INVERSE
      DO 97 L=1,K
      C=DD(L,L)
      DD(L,L)=1.0
      DO 91 J=1,K
91    DD(L,J)=DD(L,J)/C
      DO 96 I=1,K
      IF(I-L)93,96,93
93    C=DD(I,L)
```

```
      DD(I,L)=0.0
      DO 94 J=1,K
      DD(I,J)=DD(I,J)-C*DD(L,J)
94    CONTINUE
96    CONTINUE
97    CONTINUE
C
C   COMPUTE & PRINT PARTIAL CORRELATION COEFFICIENTS
      DO 98 I=1,K1
      C=DD(I,I)*DD(K,K)
      C=SQRT(C)
98    PC(I)=-DD(I,K)/C
      WRITE(6,612)
612   FORMAT('0',25X,'PARTIAL CORRELATION COEFFICIENTS BETWEEN DEP & ALL
     1 INDP VARIABLES')
      WRITE(6,610)(PC(I),I=1,K1)
C
C
C   COMPUTE & PRINT T-VALUES FOR PARTIAL CORRELATION COEFFICIENTS
      WRITE(6,613)
613   FORMAT('0',25X,'T-VALUES FOR PARTIAL CORRELATION COEFFICIENTS')
      AM=N-K
      AM=SQRT(AM)
      DO 99 I=1,K1
      C1=PC(I)
      C2=1.0-C1*C1
      C2=SQRT(C2)
99    TVAL(I)=C1*AM/C2
      WRITE(6,620)(TVAL(I),I=1,K1)
C
C
C   COMPUTATION OF REGRESSION COEFFICIENTS
      REG=0.0
      A=0.0
      DO 100 I=1,K1
100   B(I)=0.0
      DO 104 I=1,K1
      DO 104 J=1,K1
104   B(I)=B(I)+SI(I,J)*SY(J,LL)
C
C
      DO 106 I=1,K1
      A=A+B(I)*X(I)
106   REG=REG+SY(I,LL)*B(I)
      ALPHA=Y(LL)-A
      RES=SY(K,LL)-REG
      RSQR=REG/SY(K,LL)
      RSQR=SQRT(RSQR)
      M=N-K
      SIGMA=RES/M
C
      WRITE(6,614)ALPHA
614   FORMAT('0',25X,'ALPHA =',F12.5//' ',25X,'REGRESSION COEFFICIENTS')
      WRITE(6,620)(B(I),I=1,K1)
C
C
C   COMPUTATION OF ESTIMATED DISPERSION MATRIX
      A=0.0
      DO 110 I=1,K1
      DO 110 J=1,K1
      ED(I,J)=SI(I,J)*SIGMA
```

```
      A=A+X(I)*X(J)*ED(I,J)
      A=A*SIGMA/N
      A=SQRT(A)
      DO 114 I=1,K1
      C=EC(I,I)
      SERR(I)=SQRT(C)
114   TVAL(I)=B(I)/SERR(I)
      WRITE(6,616)
616   FORMAT('0',25X,'STANDARD ERRORS OF REGRESSION COEFFICIENTS')
      WRITE(6,620)(SERR(I),I=1,K1)
620   FORMAT('0',09(1X,E12.5)/' ',09(1X,E12.5))
      WRITE(6,622)
622   FORMAT('0',25X,'T-VALUES OF REGRESSION COEFFICIENTS')
      WRITE(6,620)(TVAL(I),I=1,K1)
      N1=N-1
      K2=K-1+1
      REGMSS=REG/K1
      FVAL=REGMSS/SIGMA
      WRITE(6,625)A
625   FORMAT('0',25X,'ESTIMATED STANDARD ERROR OF ALPHA =',E12.5)
      WRITE(6,626)K1,REG,REGMSS,FVAL,M,RES,SIGMA,N1,SY(K,LL),RSQR
626   FORMAT('0',25X,'ANALYSIS OF VARIANCE'//' ',20X,'SOURCE',7X,'DF',12X
     1,'SS',17X,'MSS',16X,'F'//' ',20X,'REGRESSION',3X,I2,2(5X,E16.9),
     25X,F7.3//' ',20X,'ERROR',7X,I3,2(5X,E16.9)//' ',20X,'TOTAL',7X,I3,
     45X,E15.8///' ',25X,'MULTIPLE CORRELATION COEFFICIENT =',F8.5//2')
C     ******************************************************************
      IF(FIRST)GOTO 318
      CALL CLOCK(HH,MM,SS)
      WRITE(6,9)HH,MM,SS
      FIRST=.TRUE.
318   CONTINUE
C
C
      IF(LL.LT.IK)GOTO 77
      IF(CF.GT.LCOD.OR.SRN.EQ.999)STOP 999
C
C
C     GOTO PROCESS THE NEXT SET OF DATA
      FIRST=.FALSE.
      PCF=CF
      N=0
      NERR=0
      DO 130 I=1,K1
      X(I)=0.0
      DO 130 J=1,K1
130   S(I,J)=0.0
      DO 132 L=1,IK
      Y(L)=0.0
      DO 132 J=1,K
132   SY(J,L)=0.0
      GOTO 30
C
C
C     END OF FILE
200   SRN=999
      GOTO 35
C
C     READ ERROR # IGNORE THAT RECORD.  IF MORE THAN 5 ERRORS STOP 333
222   NERR=NERR+1
      IF(NERR.GT.5)STOP 333
      GOTO 23
```

```
230     WRITE(6,231)SRN,NC1,ISRN,NC2
231     FORMAT(/0WRONG CARDS = ',I3,I1,5X,I3,I1)
        GOTO 23
```