APENDICE

Programa en Fortran para estimar los parámetros de un modelo de regresión logística, usando la función lineal discriminante.

```
C PROGRAMA PARA CALCULAR LA PROBABILIDAD DE ESTAR DESEMPLEADO
C USANDO LA FUNCION LINEAL DISCRIMINANTE
C PROGRAMA EN FORTRAN PARA LA CONTROL DATA
C AUTORES:AMALIA SYLVIA ARRIAGA Y FRANCISCO GARCIA H.
      PROGRAM PROB(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE8,TAPE2)
      DOUBLE PRECISION S,D,F
      DIMENSION X(4),X1M(3),XBM(3),BETA(3),SUM1(3),SUMO(3)
      DIMENSION DIFME(3),SUMME(3)
      DIMENSION PNAMES(4),XNAME(4),IPT(4),XDATA(4)
      DIMENSION DX1(257,3),DX0(979,3),S2X1(3,3),S2X0(3,3),TEMP1(3,257)
      DIMENSION TEMP0(3,979),SIGMA(3,3),S(3,3),VARB(3,3)
      N0=0
      N1=0
      READ(5,35)NVAR,NNAM
   35 FORMAT(2I5)
      READ(5,36)(PNAMES(I),I=1,NNAM)
   36 FORMAT(A8,A8,A8,A8)
      READ(5,37)K
   37 FORMAT(I5)
      K1=K+1
      READ(5,36)(XNAME(I),I=1,K1)
C READ POINTERS TO VARIABLES DESIRED INTO IPT AND
C NAMES OF VARIABLES INTO PNAMES
      DO 40 I=1,K1
      IPT(I)=0
      DO 38 J=1,NNAM
      IF(PNAMES(J).EQ.XNAME(I)) GO TO 39
   38 CONTINUE
      WRITE(6,9001)XNAME(I)
 9001 FORMAT(1H1,2X,12HLA VARIABLE ,A8,1X,28HNO SE ENCONTRO EN EL ARCHIV
     1O/)
      STOP
   39 IPT(I)=J
   40 CONTINUE
      WRITE(6,9002)
 9002 FORMAT(1H1,20X,45HCALCULOS CORRESPONDIENTES AL SIGUIENTE MODELO/)
      WRITE(6,9003)(I,XNAME(I),IPT(I),I=1,K1)
 9003 FORMAT(2X,65HVARIABLES A SER USADAS Y SU LOCALIZACION EN EL ARCHIV
     1O DE ENTRADA/(1X,I5,2X,A8,I6,5X,I5,2X,A8,I6,5X,I5,2X,A8,I6))
      DO 200 I=1,K
      SUMO(I)=0.0
      SUM1(I)=0.0
  200 CONTINUE
C SELECT VARIABLES TO BE INCLUDED IN THE MODEL
      DO 43 I=1,1236
      DO 330 J=1,K1
  330 X(J)=XDATA(IPT(J))
      READ(8)(XDATA(J),J=1,NVAR)
C WRITE THE SELECTED VARIABLES ON SCATCH DISK (UNIT 2).
      WRITE(2,42)(X(J),J=1,K1)
   42 FORMAT(4F4.0)
   43 CONTINUE
      REWIND 2
      REWIND 8
C DESIRED VARIABLES ARE READY TO BE READ OFF FILE 2
    1 READ(2,42)(X(J),J=1,K1)
C CHECK FOR END OF FILE
```

```
      IF(EOF(2))5,2
C CHECK IF PERSON BELONGS TO THE GROUP OF EMPLOYED PEOPLE
C CONTROL GOES TO STATEMENT 4 IF EMPLOYED,AND TO STA 3 IF UNEMPLOYED
    2 IF(X(K+1))4,3
    3 N1=N1+1
      DO 300 J=1,K
      SUM1(J)=SUM1(J)+X(J)
  300 CONTINUE
      GO TO 1
    4 N0=N0+1
      DO 400 I=1,K
      SUM0(I)=SUM0(I)+X(I)
  400 CONTINUE
      GO TO 1
    5 CONTINUE
      RN1=FLOAT(N1)
      RN0=FLOAT(N0)
C  CALCULATE THE MEANS OF THE XSS FOR THE TWO GROUPS
      DO 500 I=1,K
      X1M(I)=SUM1(I)/RN1
      X0M(I)=SUM0(I)/RN0
  500 CONTINUE
C PRINT THE MEANS OF THE XSS FOR THE TWO GROUPS
      DO 550 I=1,K
      WRITE(6,540)I,X1M(I),I,X0M(I)
  540 FORMAT(11X,16HVALOR DE LA X1M(,I1,1H),2X,F7.2,3X,16HVALOR DE LA X0
     1M(,I1,1H),2X,F7.2/)
  550 CONTINUE
C  REWIND THE TAPE TO BE READ AGAIN
      REWIND 2
      I0=0
      I1=0
C READ DATA AGAIN TO CALCULATE THE MATRICES OF DEVIATIONS
   10 READ(2,42)(X(I),I=1,K1)
C CHECK FOR END OF FILE
      IF(EOF(2))20,15
C CHECK IF PERSON BELGONS TO FIRST GROUP (UNEMPLOYED)
   15 IF(X(K+1))17,16
   16 I1=I1+1
      DO 600 J1=1,K
      DX1(I1,J1)=X(J1)-X1M(J1)
  600 CONTINUE
      GO TO 10
   17 I0=I0+1
      DO 625 J0=1,K
      DX0(I0,J0)=X(J0)-X0M(J0)
  625 CONTINUE
      GO TO 10
C TRANSPOSE THE MATRICES OF DEVIATIONS AND PLACE THEM IN MATRICES TEMP1
C AND TEMPO
   20 DO 650 I1=1,N1
      DO 650 J1=1,K
      TEMP1(J1,I1)=DX1(I1,J1)
  650 CONTINUE
      DO 675 I0=1,N0
      DO 675 J0=1,K
      TEMP0(J0,I0)=DX0(I0,J0)
```

```
  675 CONTINUE
C  NOW,CALCULATE THE MATRICES OF CROSS PRODUCTS S2X1 AND S2X0
      DO 700 J=1,K
      DO 700 I=1,K
      S2X1(J,I)=0.0
      DO 700 L=1,N1
      S2X1(J,I)=S2X1(J,I)+TEMP1(J,L)*DX1(L,I)
  700 CONTINUE
      DO 725 J=1,K
      DO 725 I=1,K
      S2X0(J,I)=0.0
      DO 725 M=1,N0
      S2X0(J,I)=S2X0(J,I)+TEMP0(J,M)*DX0(M,I)
  725 CONTINUE
C CALCULATE THE MATRIX SIGMA WHICH IS THE SUM OF THE MATRICES OF CROSS PRODUCTS
      DO 750 I=1,K
      DO 750 J=1,K
      SIGMA(I,J)=(S2X1(I,J)+S2X0(I,J))/(RN1+RN0-2.0)
  750 CONTINUE
C CALCULATE THE VECTORS DIFME AND SUMME
      DO 775 J=1,K
      DIFME(J)=X0M(J)-X1M(J)
      SUME(J)=X1M(J)+X0M(J)
  775 CONTINUE
C INVERT MATRIX SIGMA AND PLACE THE INVERSE IN SIGMA
      DO 9 I=1,K
      DO 9 J=1,K
    9 S(I,J)=SIGMA(I,J)
      DO 8 M=1,K
      D=S(M,M)
      DO 7 I=1,K
      IF(I.EQ.M)GO TO 7
      F=S(I,M)/D
      DO 11 J=1,K
      IF(J.EQ.M) GO TO 11
      S(I,J)=S(I,J)-F*S(M,J)
   11 CONTINUE
    7 CONTINUE
      DO 12 I=1,K
      S(I,M)=-S(I,M)/D
   12 S(M,I)=S(M,I)/D
    8 S(M,M)=1.0/D
      DO 6 I=1,K
      DO 6 J=1,K
    6 SIGMA(I,J)=S(I,J)
C  CALCULATE THE VECTOR OF BETAS
      DO 800 I=1,K
      BETA(I)=0.0
      DO 800 J=1,K
      BETA(I)=BETA(I)+SIGMA(I,J)*DIFME(J)
  800 CONTINUE
C  NOW,CALCULATE ALPHA
      TEMP=0.0
      DO 825 I=1,K
      TEMP=TEMP+BETA(I)*SUME(I)
  825 CONTINUE
      FNJ=FLOAT(NJ)
```

```
      FNL=FLOAT(N1)
      ALPHA=(-0.5*TEMP)
C  CALCULATE THE MATRIX OF VARIANCE-COVARIANCE
      DO 850 I=1,K
      DO 850 J=1,K
      VARB(I,J)=SIGMA(I,J)*(1./FND+1./FNL)
  850 CONTINUE
C  REWIND TAPE TO BE READ AGAIN
      REWIND 2
      WRITE(6,860)
  860 FORMAT(1H1,10X,46HCOMPARACION DE LA VARIABLE X(K1) Y F CALCULADA//1
     1 11X,5HXK1),2X,11HF CALCULADA/)
C  INITIALIZE COUNTERS NCOR AND NINCOR
      NCOR=0
      NINCOR=0
   25 READ(2,42)(X(I),I=1,K1)
      IF(EOF(2))30,26
C  CALCULATE P
   26 TEMP=0.0
      DO 875 I=1,K
      TEMP=TEMP+BETA(I)*X(I)
  875 CONTINUE
      F=1./(1.+EXP(-ALPHA-TEMP))
      WRITE(6,880)X(K1),P
  880 FORMAT(10X,F6.3,5X,F8.5/)
C  COMPARE THE VALUE OF P WITH THE VALUE OF THE VAR X(K+1)
      IF(P.GE.0.5.AND.P.LE.0.50) GO TO 900
      IF(X(K+1).EQ.1.0) GO TO 885
      NINCOR=NINCOR+1
      GO TO 25
  885 NCOR=NCOR+1
      GO TO 25
  900 IF(X(K+1).EQ.0.0) GO TO 910
      NINCOR=NINCOR+1
      GO TO 25
  910 NCOR=NCOR+1
      GO TO 25
   30 CONTINUE
C  PRINT RESULTS
      WRITE(6,1000)
 1000 FORMAT(1H1,9X,101HESTIMACION DE LOS PARAMETROS DE UN MODELO DE REG
     1RESION LOGISTICA A TRAVES DE LA FUNCION DISCRIMINANTE//20X,10HPARA
     2METRO ,10X,14HVALOR ESTIMADO/)
      WRITE(6,1001)ALPHA
 1001 FORMAT(12X,7HALPHA  ,10X,F14.8/)
      DO 1003 I=1,K
      WRITE(6,1002)I,BETA(I)
 1002 FORMAT(11X,5HBETA(,I2,1H),10X,F14.8/)
 1003 CONTINUE
      WRITE(6,1004)
 1004 FORMAT(1H1,45X,45HMATRIZ DE VARIANZAS-COVARIANZAS ASINTOTICAS /)
      DO 1006 I=1,K
      WRITE(6,1005)(VARB(I,J),J=1,K)
 1005 FORMAT(40X,3(F16.9,10X)/)
 1006 CONTINUE
      WRITE(6,1007)NCOR,NINCOR
 1007 FORMAT(20X,42HNUMERO DE CASOS CLASIFICADOS CORRECTAMENTE,3X,I4/20X
```

```
1,44HNUMERO DE CASOS CLASIFICADOS INCORRECTAMENTE,3X,I4/)
 STOP
 END
```

Se terminó de imprimir en diciembre de 1980, en el Departamento de Impresos de la Facultad de Economía, de la Universidad Autónoma de Nuevo León. Loma Redonda No. 1515 Pte., Col. Loma Larga, Monterrey, N.L., México. Se tiraron 500 ejemplares más sobrantes para reposición.

Se terminó de imprimir en diciembre de 1980, en el Departamento de Impresos de la Facultad de Economía, de la Universidad Autónoma de Nuevo León. Loma Redonda No. 1515 Pte., Col. Loma Larga, Monterrey, N.L., México. Se tiraron 500 ejemplares más sobrantes para reposición.

FACULTAD DE ECONOMIA
CENTRO DE INVESTIGACIONES ECONOMICAS