

## A P P E N D I X - I(A)

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PROGRAM ESTIMA
DIMENSION T1(1000)
COMMON ISIZE
DOUBLE PRECISION AO,BO,AON,BON,AOS,BOS,TBAR,S2T,SAO,SBO,T1,
*SUMAO,SUMBO,SUMAON,SUMBON,SUMAOS,SUMBOS,S1,S11,ZA,G,TO,TO1
OPEN(6,FILE='PRN')
SUMAO=0
SUMBO=0
SUMAON=0
SUMBON=0
SUMAOS=0
SUMBOS=0
IX=10
IY=80
IZ=122
ISIZE=200
G=ISIZE
WRITE(6,905)
905 FORMAT(10X,'ESTIMATION OF ETA & XZI BY N-R METHOD' )
DO 45 J=1,100
AO=1
BO=1
S11=0
S1=0
DO 50 I=1,ISIZE
    CALL RANDOM(IX,IY,IZ,RAND)
U1=RAND
IF(U1 .LE. 0.0) GO TO 10
TO=- ALOG(U1)/AO
20 CALL RANDOM(IX,IY,IZ,RAND)
U2=RAND
IF(U2 .LE. 0.0) GO TO 20
TO1=- ALOG(U2)/BO
T1(I)=TO+TO1
S1=S1+T1(I)
S11=S11+T1(I)*T1(I)
50 CONTINUE
G=ISIZE
TBAR=S1/G
S2T=S11/(G-1.0)-G*TBAR*TBAR/(G-1.0)
ZA=SQRT(ABS(2.0*S2T-TBAR*TBAR))
IF(TBAR .GT. ZA) THEN
SAO=2.0/(TBAR+ZA)
SBO=2.0/(TBAR-ZA)
ENDIF
IF (TBAR .LT. ZA) THEN

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SAO=2. O/(TBAR+ZA)
SBO=2. O/TBAR
ENDIF
SUMAO=SUMAO+SAO
SUMBO=SUMBO+SBO
AON=SAO
BON=SBO
AOS=SAO
BOS=SBO
CALL NEWTON ( AON,BON,G,T1 )
CALL SCORE(AOS,BOS,G,T1)
SUMAON=SUMAON+AON
SUMBON=SUMBON+BON
SUMAOS=SUMAOS+AOS
SUMBOS=SUMBOS+BOS
45 CONTINUE
WRITE(6,904)SUMAO/100. O,SUMBO/100. O,SUMAON/100. O,
*SUMBON/100. O,SUMAOS/100. O,SUMBOS/100. O
904 FORMAT(5X,'ESTIMATED VALUE OF ALPHA BY MOMENT=',D15. 7,/,
*5X,'ESTIMATED VALUE OF BETA BY MOMENT=',D15. 7,/,5X,
*'ESTIMATED VALUE OF ALPHA BY NEWTON=',D15. 7,/,5X,
*'ESTIMATED VALUE OF BETA BY NEWTON=',D15. 7,/,5X,
*'ESTIMATED VALUE OF ALPHA BY SCORE=',D15. 7,/,5X,
*'ESTIMATED VALUE OF BETA BY SCORE =',D15. 7)
STOP
END

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SUBROUTINE FSUM(AOJ,BOJ,T1,FSUMA,FSUMB,DSUM)
COMMON ISIZE
DIMENSION T1(ISIZE)
DOUBLE PRECISION A1,B1,SNRA,SNRB,SDRA,SDRB,C,D,T1,AOJ,BOJ
*,FSUMA1,FSUMB1,DSUM1,FSUMA,FSUMB,DSUM,G
FSUMA1=0
FSUMB1=0
DSUM1=0
DO 55 I=1,ISIZE
A1=DEXP(-AOJ*T1(I))
B1=DEXP(-BOJ*T1(I))
SNRA=T1(I)*A1
SNRB=T1(I)*B1
SDRA=A1-B1
C=T1(I)*T1(I)*A1*B1
D=(A1-B1)**2
FSUMA1=FSUMA1+SNRA/SDRA
FSUMB1=FSUMB1+SNRB/SDRA
DSUM1=DSUM1+C/D

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55    CONTINUE
999    FSUMA=FSUMA1
      FSUMB=FSUMB1
      DSUM=DSUM1
      RETURN
      END
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SUBROUTINE  NEWTON(AOK,BOK,G,T1)
DIMENSION   T1(1000)
DOUBLE     PRECISION     ADER,BDER,AOKNEW,BOKNEW,DELA,DELB
*,T1,ANR,ADR,AOK,BOK,BNR,BDR,G,FSUMAN,FSUMBN,DSUMN
99    CALL    FSUM(AOK,BOK,T1,FSUMAN,FSUMBN,DSUMN)
ANR=G*BOK/(AOK*(BOK-AOK))-FSUMAN
ADR=-G*(BOK*(BOK-2.0*AOK)/(AOK*AOK*(BOK-AOK)**2)-DSUMN
DELA=ANR/ADR
AOKNEW=AOK-DELA
AOK=AOKNEW
CALL    FSUM(AOK,BOK,T1,FSUMAN,FSUMBN,DSUMN)
BNR=-G*AOK/(BOK*(BOK-AOK))+FSUMBN
BDR=-G*AOK*(AOK-2.0*BOK)/(BOK*BOK*(BOK-AOK)**2)-DSUMN
DELB=BNR /BDR
BOKNEW=BOK-DELB
BOK=BOKNEW
IF((ABS(BOKNEW-BOK).LT. 1. E-7). AND.
*(ABS(AOKNEW-AOK). LT. 1. E-7)) GO TO 17
GO TO 99
17    RETURN
END
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C    SUBROUTINE FOR GENERATION OF RANDOM NUMBERS
C    SUBROUTINE      RANDOM(IX,IY,IZ,RAND)
IX=171*MOD(IX,177)-2*(IX/177)
IY=172*MOD(IY,176)-95*(IY/176)
IZ=170*MOD(IZ,178)-69*(IZ/178)
IF(IX. LT. 0) IX=IX+90269
IF(IY. LT. 0) IY=IY+90307
IF(IZ. LT. 0) IZ=IZ+90329
RAND=AMOD(FLOAT(IX)/90269. 0+FLOAT(IY)/90307. 0 +
*   FLOAT(IZ)/90329. 0      , 1. 0      )
RETURN
END
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SUBROUTINE  SCORE(AOL,BOL,G,T1)
DIMENSION      T1(1000)
DOUBLE        PRECISION   ADER,BDER,ANEW,BNEW,DELAS,DELBS
*,ANR,ADR,BNR,BDR,AOL,BOL,G,T1,PHEE,FSUMAS,FSUMBS,DSUMS
PHEE=2. 0/(BOL-AOL)**4*1. 20257
91    CALL      FSUM(AOL,BOL,T1,FSUMAS,FSUMBS,DSUMS)
ANR=G*BOL/(AOL*(BOL-AOL))-FSUMAS
ADR=-G*(BOL*(BOL-2. 0*AOL))/(AOL*AOL*(BOL-AOL)**2)-G*AOL*
* BOL*PHEE
DELAS=ANR/ADR
ANEW=AOL-DELAS
AOL=ANEW
CALL      FSUM(AOL,BOL,T1,FSUMAS,FSUMBS,DSUMS)
PHEE=2. 0/(BOL-AOL)**4*1. 20257
BNR=-G*AOL/(BOL*(BOL-AOL))+FSUMBS
BDR=-G*AOL*(AOL-2. 0*BOL)/(BOL*BOL*(BOL-AOL)**2)-G*
*AOL*BOL*PHEE
DELBS=BNR /BDR
BNEW=BOL-DELBS
BOL=BNEW
10  IF(ABS(BNEW-BOL). LT. 1. E-7), AND, (ABS(ANEW-AOL). LT. 1. E-7))
GO TO 11
GO TO 91
11  RETURN
END

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