รายการอ้างอิง

ภาษาไทย

ธีรพร วีระถาวร การอนุมานเชิงสถิติขั้นกลาง:โครงสร้างและความหมาย. กรุงเทพมหานคร : พิทักษ์การพิมพ์, 2531

คศิธร พุทไธวัฒน์ "วิธีการปรับแก้ค่าประมาณความน่าจะเป็นที่จะเสียชีวิต" วิทยานิพนธ์ปริญญามหาบัณฑิต ภาควิชาสถิติ บัณฑิตวิทยาลัยจุฬาลงกรณ์มหาวิทยาลัย

สมบัติ กุลวุฒิ. "วิธีการประมาณความน่าจะเป็นที่จะเสียชีวิต สำหรับข้อมูลประกันชีวิตที่ไม่สมบูรณ์" วิทยานิพนธ์ปริญญามหาบัณฑิต ภาควิชาสถิติ บัณฑิตวิทยาลัยจุฬาลงกรณ์มหาวิทยาลัย

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ภาคผนวก

ภาคผนวก ก

ตาราง ก แสดงค่า q_x และค่าพารามิเตอร์ β สำหรับการแจกแจงแบบเอกซ์โพเนนเชียล ซึ่งนำค่าพารามิเตอร์ไปจำลองข้อมูลเกี่ยวกับระยะเวลาที่จะมีชีวิตอยู่ต่อไปในอนาคต

x	q_x	β	x	q_x	β
0	0.00708	0.0071051	20	0.00179	0.0017916
1	0.00176	0.0017615	21	0.00183	0.0018317
2	0.00152	0.0015211	22	0.00186	0.0018617
3	0.00146	0.0014610	23	0.00189	0.0018917
4	0.00140	0.0014010	24	0.00191	0.0019118
5	0.00135	0.0013509	25	0.00193	0.0019319
6	0.00130	0.0013008	26	0.00196	0.0019619
7	0.00126	0.0012608	27	0.00199	0.0019919
8	0.00123	0.0012307	28	0.00203	0.0020320
9	0.00121	0.0012107	29	0.00208	0.0020821
10	0.00121	0.0012107	30	0.00213	0.0021322
11	0.00123	0.0012307	31	0.00219	0.0021924
12	0.00126	0.0012608	32	0.00225	0.0022525
13	0.00132	0.0013208	33	0.00232	0.0023227
14	0.00139	0.0013909	34	0.00240	0.0024029
15	0.00146	0.0014610	35	0.00251	0.0025131
16	0.00154	0.0015411	36	0.00264	0.0026434
17	0.00162	0.0016213	37	0.00280	0.0028039
18	0.00169	0.0016914	38	0.00301	0.0030145
19	0.00174	0.0017415	39	0.00325	0.0032552

ตาราง ก (ต่อ) แสดงค่า q_x และค่าพารามิเตอร์ β สำหรับการแจกแจงแบบเอกซ์โพเนนเชียล ซึ่งนำค่าพารามิเตอร์ไปจำลองข้อมูลเกี่ยวกับระยะเวลาที่จะมีชีวิตอยู่ต่อไปในอนาคต

x	q_x	β	x	q_x	β
40	0.00353	0.0035362	60	0.02034	0.0205497
41	0.00384	0.0038474	61	0.02224	0.0224910
42	0.00417	0.0041787	62	0.02431	0.0246104
43	0.00453	0.0045402	63	0.02657	0.0269293
44	0.00492	0.0049321	64	0.02904	0.0294700
45	0.00535	0.0053644	65	0.03175	0.0322649
46	0.00583	0.0058471	66	0.03474	0.0353578
47	0.00636	0.0063803	67	0.03804	0.0387824
48	0.00695	0.0069742	68	0.04168	0.0425735
49	0.00760	0.0076290	69	0.04561	0.0466828
50	0.00832	0.0083548	70	0.04979	0.0510722
51	0.00911	0.0091517	71	0.05415	0.0556713
52	0.00996	0.0100099	72	0.05865	0.0604402
53	0.01086	0.0109194	73	0.06326	0.0653495
54	0.01190	0.0119713	74	0.06812	0.0705512
55	0.01300	0.0130852	75	0.07337	0.0762009
56	0.01421	0.0143119	76	0.07918	0.0824907
57	0.01554	0.0156620	77	0.08570	0.0895965
58	0.01700	0.0171461	78	0.09306	0.0976790
59	0.01859	0.0187649	79	0.10119	0.1066836

ตาราง ก (ต่อ) แสดงค่า q_x และค่าพารามิเตอร์ β สำหรับการแจกแจงแบบเอกซ์โพเนนเชียล ซึ่งนำค่าพารามิเตอร์ไปจำลองข้อมูลเกี่ยวกับระยะเวลาที่จะมีชีวิตอยู่ต่อไปในอนาคต

x	q_x	β
80	0.10998	0.1165113
81	0.11935	0.1270950
82	0.12917	0.1383085
83	0.13938	0.1501022
84	0.15001	0.1625307
85	0.16114	0.1751150
86	0.17282	0.1897329
87	0.18513	0.2047267
88	0.19825	0.2209585
89	0.21246	0.2388411
90	0.22814	0.2589521
91	0.24577	0.2820579
92	0.26593	0.3091509
93	0.28930	0.3415049
94	0.31666	0.3807627
95	0.35124	0.4326924
96	0.40056	0.5117594
97	0.48842	0.6702514
98	0.66815	1.1030722
99	0.99999	11.5115690

ภาคผนวก ข

```
C=====================================================================
C              MAIN PROGRAM - GENERATING DATA
C=====================================================================
      DIMENSION SUMQX(100),IAGE(100),WWITH(100),DDEATH(100),EENDER(100),
     *          SUMMX(100),RTE3(100)
      COMMON/VAR1/TABQX(100),TAPQX(100)
      COMMON/VAR2/NUM,PK(100),PB(100),IFIRST,ILAST,INTAGE
      COMMON/VAR3/GRADQX(100),RTE1(100),RTE2(100),VMQX(100)
      COMMON/VAR4/K,SUMTW,SUMTD,DEATH,WITH,ENDER,VMRTE1,VMRTE2
      COMMON/VAR5/PN,U,ALP,BETA,NW
      COMMON/VAR6/VMMX(100),VMDX(100),VMEX(100)
C
C ***** ADD   DATA ******
      NUM      = 1000
      IROUND   = 200
      ISEED    = 167
      NW       = INT(0.3*NUM)
C
      U        = 1.0
      ALP      = 1.50
      BETA     = 0.25
C
      IGEN     = 1
      IFIRST   = 16
      ILAST    = 95
      INTAGE   = ILAST-IFIRST+1
C
      IAGE(1) = 0
      DO 5 I = 2,100
      IAGE(I) = IAGE(I-1)+1
5     CONTINUE
      WRITE(6,6)
6     FORMAT(85('='))
      IF (IGEN.EQ.1) THEN
      WRITE(6,10)
10    FORMAT(15X,'###### EXPONENTIAL-UNIFORM DISTRIBUTION ######')
      WRITE(6,11)
```

```
11   FORMAT(85('-'))
     WRITE(6,12)U
12   FORMAT(5X,'U = ',F5.2)
     ELSE   IF  (IGEN.EQ.2)  THEN
     WRITE(6,16)
16   FORMAT(15X,'###### EXPONENTIAL-GAMMA DISTRIBUTION ######')
     WRITE(6,17)
17   FORMAT(85('-'))
     WRITE(6,18)ALP,BETA
18   FORMAT(5X,'ALP = ',F5.2,5X,'BETA = ',F5.2)
     ENDIF
     WRITE(6,19)ISEED,NUM,IROUND,NW
19   FORMAT(5X,'SEED = ',I5,7X,'SAMPLE SIZE = ',I5,5X,'ROUND = ',I4,
    *5X,'NUMBER WITHDRAW= ',I4)
     WRITE(6,20)
20   FORMAT(85('='))
     WRITE(6,26)
26   FORMAT(1X,'AGE',6X,'DX',8X,'EX',5X,'FORCE OF MR.',3X,'EST. QX',
    *7X,'RATE',10X,'LAMDA',5X,'DEATH',4X,'WITH',3X,'ENDER')
     WRITE(6,30)
30   FORMAT(85('='))
     CALL TQX
     DO 40 K = 1,100
     PB(K) =  EXP(ALOG(1.0-TABQX(K)))
     SUMMX = 0.0
     SUMQX = 0.0
     SUMD  = 0.0
     SUMW  = 0.0
     SUME  = 0.0
     SUMEP = 0.0
     DO 45 I =1,IROUND
        DEATH = 0.0
        WITH  = 0.0
        ENDER = 0.0
        SUMTW = 0.0
        SUMTD = 0.0
      IF (IGEN.EQ.1) THEN
      CALL GENEU(ISEED)
      ELSE IF (IGEN.EQ.2) THEN
```

```
      CALL GENEG(ISEED)
      ENDIF
      ESMX  = DEATH/(FLOAT(NUM)-SUMTD-SUMTW)
      ESQX  = 1.0-EXP(-ESMX)
      SUMMX = SUMMX+ESMX
      SUMQX = SUMQX+ESQX
      SUMEP  =  SUMEP+(FLOAT(NUM)-SUMTD-SUMTW)
      SUMD   =  SUMD+DEATH
      SUMW   =  SUMW+WITH
      SUME   =  SUME+ENDER
45    CONTINUE
      VMMX(K)    =  SUMMX/IROUND
      VMQX(K)    =  SUMQX/IROUND
      VMDX(K)    =  SUMD/IROUND
      VMEX(K)    =  SUMEP/IROUND
      RTE3(K)    =  ABS(TABQX(K)-VMQX(K))/TABQX(K)*100
      WWITH(K)   =  SUMW/IROUND/NUM*100.
      DDEATH(K)  =  SUMD/IROUND/NUM*100.
      EENDER(K)  =  SUME/IROUND/NUM*100.
      WRITE(6,51)IAGE(K),VMDX(K),VMEX(K),VMMX(K),VMQX(K),RTE3(K),
     *PB(K),DDEATH(K),WWITH(K),EENDER(K)
51    FORMAT(1X,I3,3X,F7.3,2X,F9.2,3X,F10.7,3X,F10.7,3X,F10.6,
     *3X,F10.7,3X,F5.2,3X,F5.2,3X,F5.2)
40    CONTINUE
      SUMWW  = 0.0
      SUMDD  = 0.0
      SUMEE  = 0.0
      SUMER  = 0.0
      DO 1 I = 1,100
        SUMWW  =  SUMWW+WWITH(I)
        SUMDD  =  SUMDD+DDEATH(I)
        SUMEE  =  SUMEE+EENDER(I)
        SUMER  =  SUMER+RTE3(I)
1     CONTINUE
      VMWITH   =  SUMWW/100.
      VMDEA    =  SUMDD/100.
      VMEND    =  SUMEE/100.
      VMRTE3   =  SUMER/100.
      WRITE(6,59)
```

```
59    FORMAT(85('='))
      WRITE(6,60)VMRTE3,VMDEA,VMWITH,VMEND
60    FORMAT(1X,'MEAN AGE( 0 - 99 ) ==>',
     *30X,F10.7,16X,F5.2,3X,F5.2,3X,F5.2)
      WRITE(6,78)
78    FORMAT(85('='))
      CALL WHIT
      CALL BAYE
      CALL INBAYE
      STOP
      END
C=====================================================================
C                      SUBROUTINE
C       GENERATED FUTURE LIFETIME AND WITHDRAWAL TIME
C            (EXPONENTIAL-UNIFORM DISTRIBUTION)
C=====================================================================
      SUBROUTINE  GENEU(ISEED)
      COMMON/VAR1/TABQX(100),TAPQX(100)
      COMMON/VAR2/NUM,PK(100),PB(100),IFIRST,ILAST,INTAGE
      COMMON/VAR3/GRADQX(100),RTE1(100),RTE2(100),VMQX(100)
      COMMON/VAR4/K,SUMTW,SUMTD,DEATH,WITH,ENDER,VMRTE1,VMRTE2
      COMMON/VAR5/PN,U,ALP,BETA,NW
      COMMON/VAR6/VMMX(100),VMDX(100),VMEX(100)
      DO 5 I = 1,NUM
15      WUNI1   =  RAN(ISEED)
        IF (WUNI1 LE.0.0) GOTO 15
        WUNI    =  U*WUNI1
10      TEXPO1  =  RAN(ISEED)
        IF (TEXPO1 LE.0.0) GOTO 10
        TEXPO = -(1./PB(K))*ALOG(TEXPO1)
        IF (WUNI.LT.TEXPO) THEN
          IF (WITH.LT.NW) THEN
            WITH   = WITH+1.0
            SUMTW1 = 1.-WUNI
            SUMTW  = SUMTW+SUMTW1
          ELSE
            IF (TEXPO.LE.1.) THEN
              DEATH  = DEATH+1
              SUMTD1 = 1.-TEXPO
```

```
            SUMTD  = SUMTD+SUMTD1
          ELSE
            ENDER = ENDER + 1.
          ENDIF
        ENDIF
      ELSE
        IF (TEXPO LE 1.) THEN
          DEATH  = DEATH+1.
          SUMTD1 = 1.-TEXPO
          SUMTD  = SUMTD+SUMTD1
        ELSE
          ENDER = ENDER - 1
        ENDIF
      ENDIF
      RETURN
      END
C=======================================================================
C                    SUBROUTINE
C      GENERATED FUTURE LIFETIME AND WITHDRAWAL TIME
C             (EXPONENTIAL-GAMMA DISTRIBUTION)
C=======================================================================
      SUBROUTINE  GENEG(ISEED)
      COMMON/VAR1/TABQX(100),TAPQX(100)
      COMMON/VAR2/NUM,PK(100),PB(100),IFIRST,ILAST,INTAGE
      COMMON/VAR3/GRADQX(100),RTE1(100),RTE2(100),VMQX(100)
      COMMON/VAR4/K,SUMTW,SUMTD,DEATH,WITH,ENDER,VMRTE1,VMRTE2
      COMMON/VAR5/PN,U,ALP,BETA,NW
      COMMON/VAR6/VMMX(100),VMDX(100),VMEX(100)
      DO 5 I = 1,NUM
      A = 1./(2.*ALP-1.)**(1./2.)
      B = ALP-ALOG(4.)
      Q = ALP+1./A
      C = 4.5
      D = 1.+ALOG(C)
2     U1 = RAN(ISEED)
      U2 = RAN(ISEED)
      V  = A*ALOG(U1/(1.-U1))
      Y  = ALP*EXP(V)
      Z  = (U1**2.)*U2
```

```
      Z1 = ALOG(Z)
      W  = B+(Q*V)+Y
      WDZ = W+D-(C*Z)
      IF (WDZ GE 0.) THEN
         X  = Y
      ELSE
        IF (W GE Z1)  THEN
           X  = Y
        ELSE
           GOTO 2
        ENDIF
      ENDIF
         WGAM  = X*BETA
10     TEXPO1  =  RAN(ISEED)
      IF (TEXPO1.LE.0.0) GOTO 10
      TEXPO   = -(1./PB(K))*ALOG(TEXPO1)
      IF (WGAM.LT.TEXPO) THEN
        IF ((WGAM.LE.1.).AND.(WITH.LT.NW)) THEN
          WITH   = WITH+1.0
          SUMTW1 = 1.-WGAM
          SUMTW  = SUMTW+SUMTW1
        ELSE
          IF (TEXPO.LE.1.) THEN
            DEATH  = DEATH+1
            SUMTD1 = 1.-TEXPO
            SUMTD  = SUMTD+SUMTD1
          ELSE
            ENDER = ENDER + 1
          ENDIF
        ENDIF
      ELSE
        IF (TEXPO.LE.1.) THEN
          DEATH  = DEATH+1.
          SUMTD1 = 1.-TEXPO
          SUMTD  = SUMTD+SUMTD1
        ELSE
          ENDER = ENDER + 1
        ENDIF
      ENDIF
```

```
5       CONTINUE
        RETURN
        END
C=======================================================================
C                       SUBROUTINE
C                  TABLE OF MORTALITY
C=======================================================================
      SUBROUTINE  TQX
      COMMON/VAR1/TABQX(100),TAPQX(100)
      COMMON/VAR2/NUM,PK(100),PB(100),IFIRST,ILAST,INTAGE
      COMMON/VAR3/GRADQX(100),RTE1(100),RTE2(100),VMQX(100)
      COMMON/VAR4/K,SUMTW,SUMTD,DEATH,WITH,ENDER,VMRTE1,VMRTE2
      COMMON/VAR5/PN,U,ALP,BETA,NW
      COMMON/VAR6/VMMX(100),VMDX(100),VMEX(100)
        TABQX(1)  = 0.00708
        TABQX(2)  = 0.00176
        TABQX(3)  = 0.00152
        TABQX(4)  = 0.00146
        TABQX(5)  = 0.00140
        TABQX(6)  = 0.00135
        TABQX(7)  = 0.00130
        TABQX(8)  = 0.00126
        TABQX(9)  = 0.00123
        TABQX(10) = 0.00121
        TABQX(11) = 0.00121
        TABQX(12) = 0.00123
        TABQX(13) = 0.00126
        TABQX(14) = 0.00132
        TABQX(15) = 0.00139
        TABQX(16) = 0.00146
        TABQX(17) = 0.00154
        TABQX(18) = 0.00162
        TABQX(19) = 0.00169
        TABQX(20) = 0.00174
        TABQX(21) = 0.00179
        TABQX(22) = 0.00183
        TABQX(23) = 0.00186
        TABQX(24) = 0.00189
        TABQX(25) = 0.00191
```

TABQX(26) = 0.00193

TABQX(27) = 0.00196

TABQX(28) = 0.00199

TABQX(29) = 0.00203

TABQX(30) = 0.00208

TABQX(31) = 0.00213

TABQX(32) = 0.00219

TABQX(33) = 0.00225

TABQX(34) = 0.00232

TABQX(35) = 0.00240

TABQX(36) = 0.00251

TABQX(37) = 0.00264

TABQX(38) = 0.00280

TABQX(39) = 0.00301

TABQX(40) = 0.00325

TABQX(41) = 0.00353

TABQX(42) = 0.00384

TABQX(43) = 0.00417

TABQX(44) = 0.00453

TABQX(45) = 0.00492

TABQX(46) = 0.00535

TABQX(47) = 0.00583

TABQX(48) = 0.00636

TABQX(49) = 0.00695

TABQX(50) = 0.00760

TABQX(51) = 0.00832

TABQX(52) = 0.00911

TABQX(53) = 0.00996

TABQX(54) = 0.01086

TABQX(55) = 0.01190

TABQX(56) = 0.01300

TABQX(57) = 0.01421

TABQX(58) = 0.01554

TABQX(59) = 0.01700

TABQX(60) = 0.01859

TABQX(61) = 0.02034

TABQX(62) = 0.02224

TABQX(63) = 0.02431

TABQX(64) = 0.02657

```
TABQX(65) = 0.02904
TABQX(66) = 0.03175
TABQX(67) = 0.03474
TABQX(68) = 0.03804
TABQX(69) = 0.04168
TABQX(70) = 0.04561
TABQX(71) = 0.04979
TABQX(72) = 0.05415
TABQX(73) = 0.05865
TABQX(74) = 0.06326
TABQX(75) = 0.06812
TABQX(76) = 0.07337
TABQX(77) = 0.07918
TABQX(78) = 0.08570
TABQX(79) = 0.09306
TABQX(80) = 0.10119
TABQX(81) = 0.10998
TABQX(82) = 0.11935
TABQX(83) = 0.12917
TABQX(84) = 0.13938
TABQX(85) = 0.15001
TABQX(86) = 0.16114
TABQX(87) = 0.17282
TABQX(88) = 0.18513
TABQX(89) = 0.19825
TABQX(90) = 0.21246
TABQX(91) = 0.22814
TABQX(92) = 0.24577
TABQX(93) = 0.26593
TABQX(94) = 0.28930
TABQX(95) = 0.31666
TABQX(96) = 0.35124
TABQX(97) = 0.40056
TABQX(98) = 0.48842
TABQX(99) = 0.66815
TABQX(100) = 0.99999
RETURN
END
```

```
C=====================================================================
C                    FUNCTION RANDOM(0,1)
C=====================================================================
      FUNCTION RAN(ISEED)
      ISEED = ISEED*16807
      IF (ISEED.LT.0) ISEED = ISEED+2147483647+1
         RAN = ISEED
         RAN = RAN*0.465661E-9
      RETURN
      END
C---------------------------------------
C                SUBROUTINE
C           WHITTAKER  GRADUATION
C---------------------------------------
      SUBROUTINE WHIT
      COMMON/VAR1/TABQX(100),TAPQX(100)
      COMMON/VAR2/NUM,PK(100),PB(100),IFIRST,ILAST,INTAGE
      COMMON/VAR3/GRADQX(100),RTE1(100),RTE2(100),VMQX(100)
      COMMON/VAR4/K,SUMTW,SUMTD,DEATH,WITH,ENDER,VMRTE1,VMRTE2
      COMMON/VAR5/PN,U,ALP,BETA,NW
      COMMON/VAR6/VMMX(100),VMDX(100),VMEX(100)
      DOUBLE PRECISION W,Y,WU,C,L,SUM,SUML,SUMLL,SUMWX,H
      DO 500 IZ=1,4
      LAGE  = INTAGE
      LAGE1 = LAGE-1
      LAGE2 = LAGE-2
      LAGE3 = LAGE-3
      DO 2 I=IFIRST+1,ILAST+1
        N=I-IFIRST
        UMQX(N)=VMQX(I)
        REALQX(N)=TABQX(I)
2     CONTINUE
      SUMWX = 0.0
      DO 1 N=1,LAGE
        IF (UMQX(N).EQ.0.0) THEN
          W(N) = 0.0
        ELSE
          W(N) = NUM/(UMQX(N)*(1.-UMQX(N)))
        ENDIF
```

```
      SUMWX = SUMWX + W(N)
1     CONTINUE
      H = SUMWX/LAGE
C*** IZ=1 ***
      IF (IZ.EQ.1) THEN
       DO 5 I=1,LAGE
       DO 5 J=1,LAGE
        ID = ABS(I-J)
        IF (ID.EQ.0) THEN
          IF ((I.EQ.1).OR.(I.EQ.LAGE)) THEN
            C(I,J) = 1.*H+W(I)
          ELSE
            C(I,J) = 2.*H+W(I)
          ENDIF
        ELSE IF (ID.EQ.1) THEN
          C(I,J) = -1.*H
        ELSE
          C(I,J) = 0.
        ENDIF
5       CONTINUE
C*** IZ=2 ****
      ELSE IF (IZ.EQ.2) THEN
       DO 10 I=1,LAGE
       DO 10 J=1,LAGE
        ID = ABS(I-J)
        IF (ID.EQ.0) THEN
          IF ((I.EQ.1).OR.(I.EQ.LAGE)) THEN
            C(I,J) = 1.*H+W(I)
          ELSE IF ((I.EQ.2).OR.(I.EQ.LAGE1)) THEN
            C(I,J) = 5.*H+W(I)
          ELSE
            C(I,J) = 6.*H+W(I)
          ENDIF
        ELSE IF (ID.EQ.1) THEN
          IF ((((I.EQ.1).AND.(J.EQ.2)).OR.
     *        ((I.EQ.2).AND.(J.EQ.1))).OR.
     *        ((I.EQ.LAGE1).AND.(J.EQ.LAGE)).OR.
     *        ((I.EQ.LAGE).AND.(J.EQ.LAGE1)))) THEN
            C(I,J) = -2.*H
```

```
            ELSE
              C(I,J) = -4.*H
            ENDIF
          ELSE IF (ID.EQ.2) THEN
              C(I,J) = 1.*H
          ELSE
              C(I,J) = 0
          ENDIF
10      CONTINUE
C*** IZ=3 ***
      ELSE IF (IZ.EQ.3) THEN
        DO 15 I=1,LAGE
        DO 15 J=1,LAGE
          ID = ABS(I-J)
          IF (ID.EQ.0) THEN
            IF ((I.EQ.1).OR.(I.EQ.LAGE)) THEN
              C(I,J) = 1.*H+W(I)
            ELSE IF ((I.EQ.2).OR.(I.EQ.LAGE1)) THEN
              C(I,J) = 10.*H+W(I)
            ELSE IF ((I.EQ.3).OR.(I.EQ.LAGE2)) THEN
              C(I,J) = 19.*H+W(I)
            ELSE
              C(I,J) = 20.*H+W(I)
            ENDIF
          ELSE IF (ID.EQ.1) THEN
            IF (((I.EQ.1).AND.(J.EQ.2))
     *        OR.((I.EQ.2).AND.(J.EQ.1)))
     *        OR.((I.EQ.LAGE1).AND.(J.EQ.LAGE)))
     *        OR.((I.EQ.LAGE).AND.(J.EQ.LAGE1)))  THEN
              C(I,J) = -3.*H
            ELSE IF (((((I.EQ.2).AND.(J.EQ.3))
     *        OR.((I.EQ.3).AND.(J.EQ.2)))
     *        OR.((I.EQ.LAGE2).AND.(J.EQ.LAGE1)))
     *        OR.((I.EQ.LAGE1).AND.(J.EQ.LAGE2)))  THEN
              C(I,J) = -12.*H
            ELSE
              C(I,J) = -15.*H
            ENDIF
          ELSE IF (ID.EQ.2) THEN
```

```
          IF ((((I.EQ.1).AND.(J.EQ.3))
     *       OR ((I.EQ.3).AND.(J.EQ.1)))
     *       OR.((I.EQ.LAGE2) AND (J.EQ.LAGE)))
     *       OR.((I.EQ.LAGE).AND.(J.EQ.LAGE2)))  THEN
             C(I,J) = 3.*H
           ELSE
             C(I,J) = 6.*H
           ENDIF
         ELSE IF (ID.EQ.3) THEN
             C(I,J) = -1.*H
         ELSE
           C(I,J) = 0
         ENDIF
15     CONTINUE
C*** IZ=4 ***
       ELSE IF (IZ.EQ.4) THEN
         DO 20 I=1,LAGE
         DO 20 J=1,LAGE
           ID = ABS(I-J)
           IF (ID.EQ.0) THEN
             IF ((I.EQ.1).OR.(I.EQ.LAGE)) THEN
               C(I,J) = 1.*H+W(I)
             ELSE IF ((I.EQ.2).OR.(I.EQ.LAGE1)) THEN
               C(I,J) = 17.*H+W(I)
             ELSE IF ((I.EQ.3).OR.(I.EQ.LAGE2)) THEN
               C(I,J) = 53.*H+W(I)
             ELSE IF ((I.EQ.4).OR.(I.EQ.LAGE3)) THEN
               C(I,J) = 69.*H+W(I)
             ELSE
               C(I,J) = 70.*H+W(I)
             ENDIF
           ELSE IF (ID.EQ.1) THEN
             IF ((((I.EQ.1).AND.(J.EQ.2))
     *         OR ((I.EQ.2).AND.(J.EQ.1)))
     *         OR ((I.EQ.LAGE1).AND.(J.EQ.LAGE)))
     *         OR.((I.EQ.LAGE).AND.(J.EQ.LAGE1)))  THEN
               C(I,J) = -4.*H
             ELSE IF ((((I.EQ.2).AND.(J.EQ.3))
     *         OR.((I.EQ.3).AND.(J.EQ.2)))
```

```
*       OR ((I.EQ.LAGE2).AND.(J.EQ.LAGE1)))
*       .OR.((I.EQ.LAGE1).AND.(J.EQ.LAGE2)))  THEN
          C(I,J) = -28.*H
        ELSE IF ((((I.EQ.3).AND.(J.EQ.4))
*       .OR.((I.EQ.4).AND.(J.EQ.3)))
*       .OR.((I.EQ.LAGE3).AND.(J.EQ.LAGE2)))
*       .OR.((I.EQ.LAGE2).AND.(J.EQ.LAGE3)))  THEN
          C(I,J) = -52.*H
        ELSE
          C(I,J) = -56.*H
        ENDIF
      ELSE IF (ID.EQ.2) THEN
        IF (((((I.EQ.1).AND.(J.EQ.3))
*       .OR.((I.EQ.3).AND.(J.EQ.1)))
*       .OR.((I.EQ.LAGE2).AND.(J.EQ.LAGE)))
*       .OR.((I.EQ.LAGE).AND.(J.EQ.LAGE2)))  THEN
          C(I,J) = 6.*H
        ELSE IF ((((I.EQ.2).AND.(J.EQ.4))
*       .OR.((I.EQ.4).AND.(J.EQ.2)))
*       .OR.((I.EQ.LAGE3).AND.(J.EQ.LAGE1)))
*       .OR.((I.EQ.LAGE1).AND.(J.EQ.LAGE3)))  THEN
          C(I,J) = 22.*H
        ELSE
          C(I,J) = 28.*H
        ENDIF
      ELSE IF (ID.EQ.3) THEN
        IF ((((I.EQ.1).AND.(J.EQ.4))
*       .OR.((I.EQ.4).AND.(J.EQ.1)))
*       .OR.((I.EQ.LAGE3).AND.(J.EQ.LAGE)))
*       .OR.((I.EQ.LAGE).AND.(J.EQ.LAGE3))) THEN
          C(I,J) = -4.*H
        ELSE
          C(I,J) = -8.*H
        ENDIF
      ELSE  IF (ID.EQ.4) THEN
          C(I,J) = 1.*H
      ELSE
          C(I,J) = 0
      ENDIF
```

```
20      CONTINUE
      ENDIF
C******* DEFIND L(I,J)**********
      DO 205 I=1,LAGE
      DO 205 J=1,LAGE
        L(I,J)=0
205   CONTINUE
      L(1,1) = SQRT(C(1,1))
      DO 25 I=2,LAGE
        L(I,1) = C(I,1)/L(1,1)
25    CONTINUE
      DO 30 I=2,LAGE1
        SUML = 0
        I1   = I-1
        DO 35 K=1,I1
          SUML = SUML+L(I,K)**2
35      CONTINUE
        L(I,I) = SQRT(C(I,I)-SUML)
        I2 = I+1
        DO 40 J=I2,LAGE
          SUMLL = 0
          DO 45 K=1,I1
            SUMLL = SUMLL+L(J,K)*L(I,K)
45        CONTINUE
          L(J,I) = (1/L(I,I))*(C(J,I)-SUMLL)
40      CONTINUE
30    CONTINUE
      SUM = 0
      DO 50 K=1,LAGE1
        SUM = SUM+L(LAGE,K)**2
50    CONTINUE
      L(LAGE,LAGE) = SQRT(C(LAGE,LAGE)-SUM)
C******** DEFIND GRADQX **********
      DO 53 I=1,LAGE
        GRADQX(I)=0
53    CONTINUE
      DO 55 I=1,LAGE
        WU(I) = WII*UMQX(I)
55    CONTINUE
```

```
      Y(1) = WU(1)/L(1,1)
      DO 60 I=2,LAGE
        SUM = 0
        I4 = I-1
        DO 65 J=1,I4
          SUM= SUM + L(I,J)*Y(J)
65      CONTINUE
        Y(I) = (WU(I)-SUM)/L(I,I)
60    CONTINUE
      GRADQX(LAGE) = Y(LAGE)/L(LAGE,LAGE)
      DO 70 II=1,LAGE1
        SUM = 0.
        I  = LAGE-II
        I5  = I+1
        DO 75 J=I5,LAGE
          SUM = SUM + L(J,I)*GRADQX(J)
75      CONTINUE
        GRADQX(I) = (Y(I)-SUM)/L(I,I)
70    CONTINUE
      SURTE1 = 0.0
      SURTE2 = 0.0
      WRITE(6,85)
85    FORMAT(1X,'AGE',5X,'REALQX',6X,'EST.QX',8X,'GRADQX',
     * 8X,'RTE1',8X,'RTE2')
      DO 80 I=1,LAGE
        RTE1(I) = ABS(REALQX(I)-GRADQX(I))/REALQX(I)*100.
        RTE2(I) = ABS(REALQX(I)-UMQX(I))/REALQX(I)*100.
        SURTE1 = SURTE1+RTE1(I)
        SURTE2 = SURTE2+RTE2(I)
      WRITE(6,95)I,REALQX(I),UMQX(I),GRADQX(I),RTE1(I),RTE2(I)
95    FORMAT(1X,I3,3X,F10.7,3X,F10.7,3X,F10.7,3X,F8.5,3X,F8.5)
80    CONTINUE
      VMRTE1 = SURTE1/LAGE
      VMRTE2 = SURTE2/LAGE
      WRITE(6,97)VMRTE1,VMRTE2
97    FORMAT(1X,'MEAN RELATIVE ERROR ',23X,F8.5,3X,F8.5)
500   CONTINUE
      RETURN
      END
```

```
C-----------------------------------------------------------
C                    SUBROUTINE
C              BAYESIAN   GRADUATION
C-----------------------------------------------------------
      SUBROUTINE BAYE
      COMMON/VAR1/TABQX(100),TAPQX(100)
      COMMON/VAR2/NUM,PK(100),PB(100),IFIRST,ILAST,INTAGE
      COMMON/VAR3/GRADQX(100),RTE1(100),RTE2(100),VMQX(100)
      COMMON/VAR4/K,SUMTW,SUMTD,DEATH,WITH,ENDER,VMRTE1,VMRTE2
      COMMON/VAR5/PN,U,ALP,BETA,NW
      COMMON/VAR6/VMMX(100),VMDX(100),VMEX(100)
      DIMENSION A(85,85),B(85,85),BINV(85,85),DEN(85,85),
     *          AB(85,85),S(85,85),SINV(85,85),DMU(85),
     *          SMU(85),UMQX(85),PMQX(85),REALQX(85),BBT(85,85)
      DO 500 IR=1,4
      IF (IR.EQ.1) THEN
        R = 0.6
      ELSE IF (IR.EQ.2) THEN
        R = 0.7
      ELSE IF (IR.EQ.3) THEN
        R = 0.8
      ELSE IF (IR.EQ.4) THEN
        R = 0.9
      ENDIF
      CALL TPQX
      DO 5 I=IFIRST+1,ILAST+1
       II =I-IFIRST
       UMQX(II) = VMQX(I)
       PMQX(II) = TAPQX(I)
       REALQX(II) = TABQX(I)
5     CONTINUE
      N = INTAGE
      DO 10 I=1,N
      DO 10 J=1,N
      IF (I.EQ.J) THEN
        B(I,J) = (PMQX(I)*(1.-PMQX(I)))/NUM
        DEN(I,J) = 1.0
      ELSE
        B(I,J) = 0.0
```

```
      DEN(I,J) = 0.0
    ENDIF
10  CONTINUE
    SUM = 0.0
    DO 30 I=1,N
    SUM = SUM + B(I,I)
30  CONTINUE
    P = SUM/N
    DO 20 I=1,N
    DO 20 J=1,N
    I1 = ABS(I-J)
    IF (J.GT.I) THEN
      IF (J.GT.(I+10)) THEN
        A(I,J) = 0.0
      ELSE
        A(I,J) = P*(R**I1)
      ENDIF
    ELSE IF (J.LT.I) THEN
      IF (J.LT.(I-10)) THEN
        A(I,J) = 0.0
      ELSE
        A(I,J) = P*(R**I1)
      ENDIF
    ELSE
        A(I,J) = P
    ENDIF
20  CONTINUE
    DO 40 I=1,N
    DMU(I) = PMQX(I) - UMQX(I)
40  CONTINUE
    CALL INV2(B,BINV,N)
    DO 45 I=1,N
    DO 45 J=1,N
    AB(I,J) = 0.0
45  CONTINUE
    DO 50 I=1,N
    DO 50 J=1,N
    DO 50 K=1,N
    AB(I,J) = AB(I,J) + A(I,K)*BINV(K,J)
```

```
50    CONTINUE
      DO 60 I=1,N
      DO 60 J=1,N
      S(I,J) = DEN(I,J)+AB(I,J)
60    CONTINUE
      CALL INV2(S,SINV,N)
      DO 65 I=1,N
      SMU(I) = 0.0
65    CONTINUE
      SURTE1 = 0.0
      SURTE2 = 0.0
      DO 70 I=1,N
      DO 75 J=1,N
      SMU(I) = SMU(I) + SINV(I,J)*DMU(J)
75    CONTINUE
      GRADQX(I) = UMQX(I)+SMU(I)
      RTE1(I) = ABS(REALQX(I)-GRADQX(I))/REALQX(I)*100.
      RTE2(I) = ABS(REALQX(I)-UMQX(I))/REALQX(I)*100.
      SURTE1  = SURTE1+RTE1(I)
      SURTE2  = SURTE2+RTE2(I)
70    CONTINUE
      VMRTE1 = SURTE1/N
      VMRTE2 = SURTE2/N
      WRITE(6,79)
79    FORMAT(10X,'      BAYESIAN   GRADUATION     ')
      CALL BAYER(R,P)
      WRITE(6,80)R,P
80    FORMAT(15X,'WITH R = ',F5.3,5X,'P = ',F10.6)
      WRITE(6,81)
81    FORMAT(80('='))
      WRITE(6,85)
85    FORMAT(1X,'AGE',5X,'TABQX',6X,'MEANQX',8X,'GRADQX',
     * 8X,'RTE1',8X,'RTE2')
      WRITE(6,86)
86    FORMAT(80('-'))
      DO 90 K =IFIRST+1,ILAST+1
      WRITE(6,95)IAGE(K),TABQX(K),VMQX(K),GRADQX(K-IFIRST),
     * RTE1(K-IFIRST),RTE2(K-IFIRST)
95    FORMAT(1X,I3,3X,F10.7,3X,F10.7,3X,F10.7,3X,F8.5,3X,F8.5)
```

```
90    CONTINUE
      WRITE(6,91)
91    FORMAT(85('='))
      WRITE(6,100)VMRTE1,VMRTE2
100   FORMAT(1X,'MEAN RELATIVE ERROR  =',23X,F8.5,3X,F8.5)
      WRITE(6,101)
101   FORMAT(85('='))
500   CONTINUE
      RETURN
      END
C     ************************************************
C     *****       SUBROUTINE INVERSE METRIX       ******
C     ************************************************
      SUBROUTINE INV2(XTWX,OXTWX,N)
      REAL XTWX(85,85),OXTWX(85,85)
      DOUBLE PRECISION A(85,85)
      DO 5 I=1,N
      DO 5 J=1,N
       A(I,J)=(XTWX(I,J))
5     CONTINUE
      DO 10 L=1,N
       A(L,L)=-1.0D0/A(L,L)
       DO 20 I=1,N
        IF (I-L) 30,20,30
30        A(I,L)=-1.0D0*A(I,L)*A(L,L)
20     CONTINUE
       DO 40 I=1,N
       DO 40 J=1,N
        IF ((I-L)*(J-L)) 50,40,50
50        A(I,J)=A(I,J)-A(I,L)*A(L,J)
40     CONTINUE
       DO 10 J=1,N
        IF (J-L) 60,10,60
60        A(L,J)=-1.0D0*A(L,J)*A(L,L)
10    CONTINUE
      DO 70 I=1,N
      DO 70 J=1,N
       OXTWX(I,J)=-1.*SNGL(A(I,J))
C       OXTWX(I,J)=-1.0*A(I,J)
```

```
70    CONTINUE
      RETURN
      END
C=====================================================================
C              SUBROUTINE
C      INCRESING  BAYESINE  GRADUATION
C=====================================================================
      SUBFOUTINE INBAYE
      COMMON/VAR1/TABQX(100),TAPQX(100)
      COMMON/VAR2/NUM,PK(100),PB(100),IFIRST,ILAST,INTAGE
      COMMON/VAR3/GRADQX(100),RTE1(100),RTE2(100),VMQX(100)
      COMMON/VAR4/K,SUMTW,SUMTD,DEATH,WITH,ENDER,VMRTE1,VMRTE2
      COMMONVAR5/PN,U,ALP,BETA,NW
      COMMONVAR6/VMMX(100),VMDX(100),VMEX(100),TOL
      DIMENSION  PPHI(50),VM(50),H(50),R(50),B(50),PHI0(50),
     *           PHI1(50),PHI(50),PHIERR(50),CETA0(50),PFMX(50)
      DO 500 IM=1,3
      IF (IM.EQ.1) THEN
        M = 1
      ELSE IF (IM EQ 2) THEN
        M = 5
      ELSE IF (IM EQ.3) THEN
        M = 25
      ENDIF
      MAXIT = 100
      TOL   = 0.01
      KK = INTAGE
      CALL TPQX
      DO 5 I=1,KK
       PFMX(I) = -ALOG(1.-TAPQX(IFIRST+I))
       WRITE(6,3)I,TAPQX(IFIRST+I),PFMX(I),VMEX(IFIRST+I),
     *           VMDX(IFIRST+I)
3      FORMAT(3X,I3,3X,F10.7,3X,F10.7,3X,F10.3,3X,F10.3)
5     CONTINUE
      DO 10 I=1,KK
       IF (I.EQ.1) THEN
         PPHI(I) = PFMX(I)
       ELSE
         PPHI(I) = PFMX(I)-PFMX(I-1)
```

```
      ENDIF
10    CONTINUE
      SUMVM = 0
      SUMH  = 0
      DO 20 I=1,KK
       VM(I) = (EXP(PFMX(I))-1)/VMEX(IFIRST+I)
       SUMVM = SUMVM + VM(I)
       H(I)  = KK-I-1
       SUMH  = SUMH + H(I)*(PPHI(I)**2)
20    CONTINUE
      U = SUMH/(2 *M*SUMVM)
      ALPHA = 1 +U+SQRT(U**2 +U))
      WRITE(6,*) ALPHA
      DO 30 I=1,KK
       R(I) = (ALPHA-1)/ PPHI(I)
       WRITE(6,*)I,R(I)
30    CONTINUE
      DO 40 I=1,KK
       SUME = 0
       DO 45 J=I,KK
        SUME = SUME + VMEX(IFIRST+J)
45     CONTINUE
       B(I) = R(I) + SUME
       WRITE(6,*)I,B(I)
40    CONTINUE
      DO 50 I=1,KK
       PHI0(I) = PPHI(I)
       CETA0(I) = PFMX(I)
50    CONTINUE
      IT = 1
      DO 60 II =1,N
       DO 65 I=1,KK
        PHI1(I) = PHI0(I)
65     CONTINUE
      DO 70 I=1,KK
       SUM1 = 0
       SUM2 = 0
       DO 75 J=I,KK
        SUM1 = SUM1 + VMDX(IFIRST+J)/CETA0(J)
```

```
      SUM2 = SUM2 + (-VMDX(IFIRST+J)/CETA0(J)**2)
75    CONTINUE
      F  = SUM1 + (ALPHA -1)/PHI0(I) - B(I)
      FP = SUM2 - (ALPHA -1)/(PHI0(I)**2)
      PHI(I) = PHI0(I) - F/FP
      IF (PHI(I).LT.0.) THEN
      PHI(I) = PHI0(I)* 5
      ENDIF
      PHI0(I) = PHI(I)
      DO 80 L=1,KK
      CETA0(L) = 0.
      DO 80 LL=1,L
       CETA0(L) = CETA0(L) + PHI0(LL)
80    CONTINUE
70    CONTINUE
      DO 90 I=1,KK
      PHIERR(I) = 100*ABS(PHI1(I)-PHI0(I))/PHI1(I)
90    CONTINUE
      TEMP = PHIERR(1)
      DO 100 I=2,KK
      IF (PHIERR(I).GT.TEMP) THEN
        TEMP = PHIERR(I)
      ENDIF
100   CONTINUE
      IF (TEMP .GT.TOL) THEN
      IT = IT + 1
      GOTO 60
      ELSE
      SURTE1 = 0.0
      SURTE2 = 0.0
      DO 170 I=1,KK
      IJ = IFIRST+I
      GRADQX(IJ) = 1- EXP(-CETA0(I))
      RTE1(IJ)   = ABS(TABQX(IJ)-GRADQX(IJ))/TABQX(IJ)*100
      RTE2(IJ)   = ABS(TABQX(IJ)-VMQX(IJ))/TABQX(IJ)*100
      SURTE1     = SURTE1 + RTE1(IJ)
      SURTE2     = SURTE2 + RTE2(IJ)
170   CONTINUE
      VMRTE1 = SURTE1/KK
```

```
      VMRTE2 = SURTE2/KK
      WRITE(6,110) IT
110    FORMAT(2X,'NUMBER OF ITERATION = ',I3)
      WRITE(6,79)
79     FORMAT(10X,'  INCREASING  BAYESIAN  GRADUATION     ')
      WRITE(6,80)M
80     FORMAT(15X,'WITH M = ',I10)
      WRITE(6,81)
81     FORMAT(80('='))
      WRITE(6,85)
85     FORMAT(1X,'AGE',5X,'TABQX',6X,'MEANQX',8X,'GRADQX',
     * 8X,'RTE1',8X,'RTE2')
      WRITE(6,86)
86     FORMAT(80('-'))
      DO 90 K =IFIRST+1,ILAST+1
      WRITE(6,95)IAGE(K),TABQX(K),VMQX(K),GRADQX(K),
     * RTE1(K),RTE2(K)
95     FORMAT(1X,I3,3X,F10.7,3X,F10.7,3X,F10.7,3X,F8.5,3X,F8.5)
90     CONTINUE
      WRITE(6,91)
91     FORMAT(85('='))
      WRITE(6,100)VMRTE1,VMRTE2
100    FORMAT(1X,'MEAN RELATIVE ERROR  =',23X,F8.5,3X,F8.5)
      WFITE(6,101)
101    FORMAT(85('='))
      GOTO 160
      ENDIF
60     CONTINUE
140    WRITE(6,150)IT
150    FORMAT(3X,'ITERATION FAILER ,MAX ITERATION = ',I3)
160    RETURN
      END
C=================================================================
C                    SUBROUTINE
C              TABLE OF PIOR MORTALITY   (THAI 2529)
C=================================================================
      SUBROUTINE  TPQX
      COMMON/VAR1/TABQX(100),TAPQX(100)
      COMMON/VAR2/NUM,PK(100),PB(100),IFIRST,ILAST,INTAGE
```

```
      COMMON/VAR3/GRADQX(100),RTE1(100),RTE2(100),VMQX(100)
      COMMON/VAR4/K,SUMTW,SUMTD,DEATH,WITH,ENDER,VMRTE1,VMRTE2
      COMMON/VAR5/PN,U,ALP,BETA,NW
      COMMON/VAR6/VMMX(100),VMDX(100),VMEX(100)
        TAPQX(1)  = 0.0087721
        TAPQX(2)  = 0.0021806
        TAPQX(3)  = 0.0018833
        TAPQX(4)  = 0.0018089
        TAPQX(5)  = 0.0017346
        TAPQX(6)  = 0.0016727
        TAPQX(7)  = 0.0016107
        TAPQX(8)  = 0.0015611
        TAPQX(9)  = 0.0015240
        TAPQX(10) = 0.0014992
        TAPQX(11) = 0.0015027
        TAPQX(12) = 0.0015486
        TAPQX(13) = 0.0015936
        TAPQX(14) = 0.0016542
        TAPQX(15) = 0.0017275
        TAPQX(16) = 0.0018089
        TAPQX(17) = 0.0018938
        TAPQX(18) = 0.0019778
        TAPQX(19) = 0.0020574
        TAPQX(20) = 0.0021297
        TAPQX(21) = 0.0021937
        TAPQX(22) = 0.0022489
        TAPQX(23) = 0.0022962
        TAPQX(24) = 0.0023370
        TAPQX(25) = 0.0023728
        TAPQX(26) = 0.0024049
        TAPQX(27) = 0.0024347
        TAPQX(28) = 0.0024640
        TAPQX(29) = 0.0024951
        TAPQX(30) = 0.0025311
        TAPQX(31) = 0.0025766
        TAPQX(32) = 0.0026359
        TAPQX(33) = 0.0027137
        TAPQX(34) = 0.0028135
        TAPQX(35) = 0.0029366
```

TAPQX(36) = 0.0030832

TAPQX(37) = 0.0032514

TAPQX(38) = 0.0034380

TAPQX(39) = 0.0036382

TAPQX(40) = 0.0038468

TAPQX(41) = 0.0040593

TAPQX(42) = 0.0042752

TAPQX(43) = 0.0044989

TAPQX(44) = 0.0047416

TAPQX(45) = 0.0050195

TAPQX(46) = 0.0053523

TAPQX(47) = 0.0057574

TAPQX(48) = 0.0062479

TAPQX(49) = 0.0068294

TAPQX(50) = 0.0075010

TAPQX(51) = 0.0082560

TAPQX(52) = 0.0090864

TAPQX(53) = 0.0099849

TAPQX(54) = 0.0109507

TAPQX(55) = 0.0119891

TAPQX(56) = 0.0131040

TAPQX(57) = 0.0143237

TAPQX(58) = 0.0156643

TAPQX(59) = 0.0171360

TAPQX(60) = 0.0187387

TAPQX(61) = 0.0205027

TAPQX(62) = 0.0224179

TAPQX(63) = 0.0245045

TAPQX(64) = 0.0267826

TAPQX(65) = 0.0292723

TAPQX(66) = 0.0320040

TAPQX(67) = 0.0350179

TAPQX(68) = 0.0383443

TAPQX(69) = 0.0420134

TAPQX(70) = 0.0459749

TAPQX(71) = 0.0501883

TAPQX(72) = 0.0545832

TAPQX(73) = 0.0591192

TAPQX(74) = 0.0637661

```
TAPQX(75) = 0.0686650
TAPQX(76) = 0.0739570
TAPQX(77) = 0.0798134
TAPQX(78) = 0.0863856
TAPQX(79) = 0.0938045
TAPQX(80) = 0.1019995
TAPQX(81) = 0.1108598
TAPQX(82) = 0.1203048
TAPQX(83) = 0.1302034
TAPQX(84) = 0.1404950
TAPQX(85) = 0.1512101
TAPQX(86) = 0.1624291
TAPQX(87) = 0.1742026
TAPQX(88) = 0.1866110
TAPQX(89) = 0.1998360
TAPQX(90) = 0.2141597
TAPQX(91) = 0.2299651
TAPQX(92) = 0.2477362
TAPQX(93) = 0.2680574
TAPQX(94) = 0.2916144
TAPQX(95) = 0.3191933
TAPQX(96) = 0.3540499
TAPQX(97) = 0.4037645
TAPQX(98) = 0.4920552
TAPQX(99) = 0.6734952
TAPQX(100) = 0.9999999
RETURN
END
```

ประวัติผู้เขียน

นางสาว นงลักษณ์ สวัสดิรักษา เกิดวันที่ 27 พฤษภาคม พ.ศ. 2511 สำเร็จการศึกษาปริญญาวิทยาศาสตร์บัณฑิต จากภาควิชาคณิตศาสตร์ คณะวิทยาศาสตร์ มหาวิทยาลัยธรรมศาสตร์ ในปีการศึกษา 2532 และเข้าศึกษาต่อในหลักสูตรวิทยาศาสตร์มหาบัณฑิต สาขาการประกันภัย ภาควิชาสถิติ คณะพาณิชย์ศาสตร์และการบัญชี จุฬาลงกรณ์มหาวิทยาลัย ในปีการศึกษา 2536 ปัจจุบันทำงานในตำแหน่งหัวหน้าแผนกสถิติคณิตศาสตร์ ฝ่ายคณิตศาสตร์ บริษัท ประกันชีวิตศรีอยุธยา จาร์ดีน ซีเอ็มจี จำกัด (มหาชน)