

บรรณานุกรม

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ภาคผนวก

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จุฬาลงกรณ์มหาวิทยาลัย

ภาคผนวก ก

สูตรสถิติที่ใช้ในการวิจัย

1. ทดสอบความแตกต่างของความยาวของข้อสอบโดยใช้ t-test

$$t = \frac{\bar{X} - M}{S/\sqrt{n}}$$

\bar{X} คือ ค่าเฉลี่ยของค่าความยาว b ของแต่ละข้อในการทำซ้ำ 100 ครั้ง

คือ ค่าความยาว b ของแต่ละข้อที่จำลองขึ้นในการทดลอง

S คือ ค่าส่วนเบี่ยงเบนมาตรฐานของค่าความยาว

n คือ จำนวนครั้งในการทำซ้ำ คือ 100 ครั้ง

2. ทดสอบความแตกต่างของค่าความคลาดเคลื่อนมาตรฐานของค่าความยาว โดยใช้ Kruskal - Wallis test

$$H = \frac{12}{N(N+1)} \sum_{k=1}^k \frac{R_k^2}{n_k} - 3(N+1)$$

N คือ ผลรวมของจำนวนข้อทดสอบของกลุ่มผู้สอบทั้ง 3 กลุ่ม

n คือ จำนวนข้อทดสอบของแต่ละกลุ่มผู้สอบ

k คือ จำนวนกลุ่มผู้สอบ

$\sum R$ คือ ผลรวมของการเรียงลำดับในแต่ละกลุ่มผู้สอบ

3. $SD. = \sum_{n=1}^{100} \sqrt{\frac{b_n - \bar{b}}{n}}$

$$SE_{\bar{b}} = \frac{SD}{\sqrt{n}}$$

- SD. คือ ส่วนเบี่ยงเบนมาตรฐานของค่าความยาก
- n คือ จำนวนครั้งในการทำซ้ำ
- b คือ ค่าความยากที่ประมาณค่าในแต่ละครั้ง
- \bar{b} คือ ค่าเฉลี่ยของค่าความยาก
- $SE_{\bar{b}}$ คือ ค่าความคลาดเคลื่อนมาตรฐานของค่าความยาก



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TSR2
5 RED=500 TIME=TIME
1) FORT51
-----C
TEST SKEWNESS & KURTOSIS FOR
POSITIVE SKEWNESS POPULATION
BY EQUATION OF FLIFISHMAN
-----C
IMPLICIT REAL*8(A-H, I-Z)
DIMENSION Y(10000)
COMMON IA
IA = 55559
SD=1.
EX=0
A=-2.5265
B=1.14050961
C=0.2001708
D=-0.03861910
WRITE(6,100)
100 FORMAT(6X, 'MEAN', 5X, 'VARIANCE', 5X, 'SKEW', 3X, 'KURTOSIS', 7X, 'B', 9X, '
*C', 10X, 'D' /)
SY = 0.
DO 5 I=1, 10000
CALL NORMAL(EX, STD, X)
E = C*(X**2)
F = D*(X**3)
Y(I) = A+(B*X)+E+F
SY = SY+Y(I)
5 CONTINUE
AMEAN = SY/10000.
CALL VAR(Y, 10000, AMEAN, VR)
SD = DSQRT(VR)
CALL KURT(Y, 10000, AMEAN, SD, ZKR)
CALL SKEW(Y, 10000, AMEAN, SD, SK)
WRITE(6, 200) AMEAN, VR, SK, ZKR, B, C, D
200 FORMAT(1X, F9.4, 1X, F9.5, 1X, F9.6, 1X, F9.6, 2X, F10.3, 1X, F10.7, 1X, F10.7)
STOP
END
***** NORMAL *****
SUBROUTINE NORMAL(EX, STD, X)
IMPLICIT REAL*8(A-H, I-Z)
COMMON IA
A = 0.
DO 5 I=1, 12
CALL RANDOM(IA, IY, RN)
5 A = A+RN
X = EX+(STD)*(A-C.)
RETURN
END
***** RANDOM *****
SUBROUTINE RANDOM(IX, IY, RN)
IMPLICIT REAL*8(A-H, I-Z)
COMMON IA
IY = IX*55559
IF(IY)5,6,6

```



```

5 IY = IY+2147483647+1
6 RI = IY
RI = RI*.4656613E-9
IK = IY
IA = IX
RET RCI
END

```

VARIANCE

```

SUBROUTINE VAR(Y,N,AMEAN,VR)
IMPLICIT REAL*8(A-H,I-Z)
DIMENSION Y(10000)
SA = 0
DO 11 I=1,N
11 SA = SA+(Y(I)-AMEAN)**2
VR = SA/10000.
RETURN
END

```

SKENESS

```

SUBROUTINE SKEW(Y,N,AMEAN,SD,SK)
IMPLICIT REAL*8(A-H,I-Z)
DIMENSION Y(10000)
SA = 0.
DO 1 I=1,N
1 SA = SA+(Y(I)-AMEAN)**3
S = SD**3
SK = SA/(10000.*S)
RETURN
END

```

KURTOSIS

```

SUBROUTINE KURT(Y,N,AMEAN,SD,ZKR)
IMPLICIT REAL*8(A-H,I-Z)
DIMENSION Y(10000)
SA = 0.
DO 2 I=1,N
2 SA = SA+(Y(I)-AMEAN)**4
S = SD**4
ZKR = SA/(10000.*S)
RETURN
END

```

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10 DIMENSION Y(10000) 10000,000,000,000

11 575 REG=500 TIME MAX
12 LOAD FORT,1

TEST SKEWNESS & KURTOSIS FOR
NORMAL POPULATION
BY EQUATION OF FLEISSMAN

C
C
C
C
C
C

DIMENSION Y(10000)

REAL KR
1A = 65535
EX = 0.
STD = 1.

WRITE(0,100)

SY = 0.
DO 5 I=1,10000
CALL HORIAT(1A,EX,STD,X)

Y(I)=X
SY = SY+Y(I)
5 CONTINUE
AMEAN = SY/10000.

CALL VARTY(10000,AMEAN,VR)
SD = SQR(VR)
CALL KORTG(Y,10000,AMEAN,SD,KR)
CALL SKRT(Y,10000,AMEAN,SD,SK)
WRITE(0,1000MEAN,VR,SK,KR)

100 FORMAT(10X,'MEAN',10X,'V VARIANCE',10X,'SKEW',10X,'KURTOSIS'/)

200 FORMAT(5X,F8.0,5X,F3.0,5X,F7.3,7X,F3.0)

STOP
END

***** NORMAL *****

SUBROUTINE NORMAL(1A,EX,STD,X)

A = 0.0
DO 5 I=1,1A
CALL RANDOM(1A,IY,KR)
IA=IY
5 A = A+KR
X = EX+(STD)*(A-0.0)
RETURN
END

***** RANDJ1 *****

SUBROUTINE RANDOM(IX,IY,RI)

IY = IX*65539
IF(IY)5,0,0
5 IY = IY+2147483647+1
6 RI = IY
RI = RI*.4853315E-9
RETURN
END

***** VARIANCE *****

SUBROUTINE VAR(Y,N,AMEAN,VR)

DIMENSION Y(10000)
SY = 0.0
DO 11 I= 1,N
11 SY= SY+(Y(I)-AMEAN)**2

YK=SY/10000.0

RETURN

END

***** SKELITE S *****

SUBROUTINE SKEL(Y,N,AREA1,SD,SK)

DIENSIONITY(10000)

SA = 0.0

DO 1 I=1,N

1 SA = SA+(Y(I)-AREA1)**3

3 = SD**3

SK = SA/10000.0

RETURN

END

***** KUTOSTS *****

SUBROUTINE KUT(Y,N,AREA1,SD,KR)

DIENSIONITY(10000)

REAL KR

SA = 0.0

DO 2 I=1,N

2 SA = SA+(Y(I)-AREA1)**4

B = SD**4

KR=SA/10000.0

RETURN

END

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VID TSKR BAAK,000,009,999

SYSD=5000 TIME=MAX

LEAD FORTGI

TEST SKENNESS & KURTOSIS FOR
NEGATIVE SKENNESS POPULATION
BY RECURSION OF FLITCHMAN

IMPLICIT REAL*8(A-H, I-Z)

PARAMETER (N=10000)

COMMON IA

IA = 35559

STD=1.

EX=0

A=2.345

B=1.505091

C=-0.271070

D=-0.0923190

WRITE(6,100)

100 FORMAT(4X,'MEAN',5X,'VARIANCE',5X,'SKEN',5X,'KURTOSIS',7X,'EX',
*C',10X,'D')/)

SY = 0.

DO 5 I=1,10000

CALL NORMAL(EX,STD,K)

E = E*(X**2)

F = D*(X**3)

Y(I)=A+(B*X)+C+F

SY = SY+Y(I)

5 CONTINUE

AMEAN = SY/10000.

CALL VAR(Y,10000,AMEAN,VR)

SD =DSQRT(VR)

CALL KURT(Y,10000,AMEAN,SD,ZKR)

CALL SKEN(Y,10000,AMEAN,SD,SK)

WRITE(6,200)AMEAN,VR,SK,ZKR,B,C,D

200 FORMAT(1X,F9.4,1X,F9.3,1X,F9.5,1X,F9.6,ZK,FTC.8,1X,FTC.7,1X,FTC.7)
STOP

END

***** JOURNAL *****

SUBROUTINE NORMAL(EX,STD,X)

IMPLICIT REAL*8(A-H, I-Z)

COMMON IA

A = 0.

DO 5 I=1,12

CALL RANDOM(IA,IY,R)

5 A = A+R

X = EX+(STD)*(A-C.)

RETURN

END

***** RANDU *****

SUBROUTINE RANDOM(IX,IY,R)

IMPLICIT REAL*8(A-H, I-Z)

COMMON IA

IY = IX#35559

IF(IY)5,5,6

```

5 IY = 1Y+2147483647+1
6 RI = 1Y
  RI = RN*.4656613E-9
  IX = 1Y
  IA = 1K
RETURN
END

```

```

***** VARIANCE *****
SUBROUTINE VAR(Y,N,AMEAN,VR)
  IMPLICIT REAL*8(A-H,I-Z)
  DIMENSION Y(10000)
  SY = 0
  DO I=1,N
1  SY = SY+(Y(I)-AMEAN)**2
  VR = SY/10000.
RETURN
END

```

```

***** SKELNESS *****
SUBROUTINE SKW(Y,N,AMEAN,SD,SK)
  IMPLICIT REAL*8(A-H,I-Z)
  DIMENSION Y(10000)
  SA = 0.
  DO I=1,N
1  SA = SA+(Y(I)-AMEAN)**3
  B = SD**3
  SK = SA/(10000.*B)
RETURN
END

```

```

***** KURTOSIS *****
SUBROUTINE LKRT(Y,N,AMEAN,SD,ZKR)
  IMPLICIT REAL*8(A-H,I-Z)
  DIMENSION Y(10000)
  SA = 0.
  DO I=1,N
2  SA = SA+(Y(I)-AMEAN)**4
  B = SD**4
  ZKR = SA/(10000.*B)
RETURN
END

```

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```

//BAAKSKP3      JOB CLASS=T,MSGLEVEL=(1,1),TYPRUN=HCLD
//              EXEC  FORTVCLG,FVSOURCE='NCSOURCE',FVSR CFL='NCSRCFLG'
//FORT.SYSIN    DD *
C*****
C  PROGRAM SIMULATION TO FIND PARAMETERS OF ITEM DIFFICULTY(B) *
C              OF RASCH MODEL *
C              WHEN POPULATION ARE POSITIVE SKEW *
C              STATISTICAL OF SAMPLES: *
C              MEAN =-2005          VARIANCE = 0.996 *
C              SKEWNESS =0.913    KURTOSIS = 3.092 *
C*****
C
C  DIMENSION XETA(500),B(30),IU(500,30,20)
C  DATA B/ -4.0000,-3.7241,-3.4482,-3.1724,-2.8965,-2.6206,-2.3448,-2.
*0689,-1.7931,-1.5172,-1.2413,-0.9655,-0.6896,-0.4137,-0.1379,0.137
*9,0.4137,0.6896,0.9655,1.2413,1.5172,1.7931,2.0689,2.3448,2.6206,2
*.8965,3.1724,3.4482,3.7241,4.0000/
C  IA=65539
C  IB=65539
C  EX=0.
C  STD=1.0
C*****CALL XETA TO FIND RESPONSE *****/
C  A=-2.3265
C  B1=1.14050961
C  C=0.2909708
C  D=-0.0886191
C  DO 41 N=1,500
C  CALL GAUSS1(IA,EX,STD,AY)
C  X1=B1*AY
C  X2=C*(AY**2)
C  X3=D*(AY**3)
C  XE=A+X1+X2+X3
C  XETA(N)=XE
C  41 CONTINUE
C  DO 40 N=1,500
C*****COMPUTE PROBABILITY OF RESPONSE *****/
C  DO 30 J=1,30
C  AXETA=XETA(N)
C  AB=B(J)
C  CALL PUB(AXETA,AB,AX)
C  DO 20 I=1,20
C  CALL NORMAL(IB,EX,STD,Z)
C*****RESPONSE REPEATED 100 TIMES *****/
C  IF(Z.GE.AX)GO TO 15
C  IJ(N,J,I)=1
C  GO TO 20
C  15 IU(N,J,I)=0
C  20 CONTINUE
C  30 CONTINUE
C  40 CONTINUE
C***** WRITE RESPONSE EACH SAMPLES *****/
C  DO 10 L=1,20
C  I=0
C  DO 50 N=1,500
C  I=I+1
C  WRITE(4,16)I,(IU(N,M,L),M=1,30),XETA(N)
C  16 FORMAT(2X,I3,2X,30(I1),2X,F7.3,34X)

```

```

10 50 CONTINUE
      END FILE 4
      REWIND 4
      CALL BICAL
      REWIND 4
10 CONTINUE
      WRITE(6,111)IB
111 FORMAT(10X,'SEED =',I10/)
      STOP
      END

```

```

C
C*****SUBROUTINE TO FIND PROBABILITY *****/
C

```

```

      SUBROUTINE POB(AXETA,AB,AX)
      C=EXP(AXETA-AB)
      P=C/(1+C)
      CALL NDTRI(P,X,D,IER)
      AX=X
      RETURN
      END

```

```

C
C*****SUBROUTINE TO FIND Z-SCORES *****/
C

```

```

      SUBROUTINE NDTRI(P,X,D,IE)
      IE=0.
      X=0.99999E+74
      D=X
      IF(P)1,4,2
1      IE=-1
      GO TO 12
2      IF(P-1.0)7,5,1
4      X=-0.99999E+74
5      D=0.0
      GO TO 12
7      D=P
      IF(D-0.5)9,9,8
8      D=1.0-D
9      T2=ALOG(1.0/(D*D))
      T=SQRT(T2)
      X=T-(2.515517+0.802853*T+0.010328*T2)/(1.0+1.432788*T+0.189269*T2+
      *0.001308*T*T2)
      IF(P-0.5)10,10,11
10     X=-X
11     D=0.3989423*EXP(-X*X/2.0)
12     RETURN
      END

```

```

C
C*****SUBROUTINE TO FIND NORMAL RANDOM NUMBERS *****/
C

```

```

      SUBROUTINE GAUSSI(IA,EX,STD,Z)
      A=0.0
      DO 5 I = 1,12
      CALL RANDUM(IA,IY,RN)
      IA=IY
5      A = A+RN
      Z = EX+(STD)*(A-6.0)
      RETURN

```

END

C*****SUBROUTINE TO FIND NORMAL RANDOM NUMBERS *****/

SUBROUTINE NORMAL(A, EX, STD, Z)

A=0.0

DO 5 I = 1,12

CALL RANDOM(A, IY, RI)

IA=IY

5 A = A+RN

Z = EX+(STD)*(A-6)

RETJR I

END

C*****SUBROUTINE RANDOM *****/

SUBROUTINE RANDOM(IX, IY, RN)

IY = IX*65539

IF(IY)5,6,6

5 IY = IY+2147483647+1

6 RN = IY

RI = RN* 4656613E-9

RETJR I

END

C*****SUBROUTINE RASCH MODEL *****/

SUBROUTINE BICAL

DIMENSION ABIL(1000),DIFF(540),IB(1000),IS(180),MATX(1300)

DIMENSION A(480),C(430),ID(180),IDATA(180),ISEL(1000),SNAME(180)

DIMENSION DLAB(180),ISEL(180),ISSW(180),SE(180),TZ(180),Z(180),

IALAB(12),ZLAB(12),XLAB(12),YLAB(12),SSW(180),SSW2(180),FSSW(180)

DIMENSION EX(180),PB(180),STAT(28),SEA(180),WLAB(12)

DATA YLAB/'F','I','T',' ','T',' ','T','E','S','T',' ',' ' //

DATA XLAB/'P','E','R','S','O','N',' ','A','B','L','T','Y' //

DATA DLAB/'D','I','F','F','I','C','U','L','T','Y' //

DATA ALAB/'D','I','S','C','R','I','M','I','N','I','T','I','O','N' //

DATA ZLAB/'T','O','T','A','L',' ','T',' ','T','E','S','T' //

DATA WLAB/'B','E','T','W','I','T',' ','T','E','S','T' //

COMMON NITEM,NGROP,MINSC,MAXSC,LREC,MSUBJ,IC,KCAB,ISW(11)

1, SNAME

COMMON/CFIT/CFIT

COMMON/MGROP/MGROP

COMMON/DCK/XTMN,XTSD,LOOP,NDEL,NDEL1

COMMON /PLGTR/ YMIN,YMAX,XMIN,XMAX,NROW,NCOL

COMMON/MSUBJ/MSUBJ,IBK

COMMON/PFIT/PFITS,PFITSD

COMMON /FURN/ FMT(13),ZSTAR(180)

IBK = 0

NDEL = 0

C WRITE(6,105)

1 CALL PAGE(1,J)

CALL REDDP(IDATA,IB,IS,ISEL,A,C,DIFF)

LOOP = 6

4 NDEL1 = NDEL

IF(NDEL.GT.0)CALL PAGE(2,J)

CALL EDITD(1B,1S,ISEL,MATX)

CALL ESTIM(1S,1B,DIFF,SE,ABIL,ISEL,MATX,KCAB,SEA)

CALL NEWTAB (ABIL,IB,DIFF,0.2,ISEL,MATX(NITEM+1))

CALL PAGE(5,J)

105 FORMAT(1H1/////////50X,3B('*')//50X,'***** R A S C H M O D E L

```

//BAAKHOR1      JOB CLASS=T,MSGLEVEL=(1,1),TYPRUN=HOLD
//              EXCL  FORTVCLG,FVSOURCE='NCSOURCE',FVSR CFL='NCSRCFLG'
//FORT.SYSTN    DD *
C*****
C PROGRAM SIMULATION TO FIND PARAMETERS OF ITEM DIFFICULTY(B)
C              OF RASCH MODEL
C              WHEN POPULATION ARE NORMAL
C STATISTICAL OF SAMPLES:
C              MEAN =0.022          VARIANCE = 1.012
C              SKEWNESS =-0.048    KURTOSIS = 2.955
C*****
C DIMENSION XETA(500),B(30),IU(500,30,20)
C DATA B/ -4.0000,-3.7241,-3.4482,-3.1724,-2.8965,-2.6206,-2.3448,-2.
*0689,-1.7931,-1.5172,-1.2413,-0.9655,-0.6896,-0.4137,-0.1379,0.137
*9,0.4137,0.6896,0.9655,1.2413,1.5172,1.7931,2.0689,2.3448,2.6206,2
*.8955,3.1724,3.4482,3.7241,4.0000/
C IA=65539
C IB=65539
C EX=0.
C STD=1.0
C*****CALL XETA TO FIND SAMPLES *****/
C DD 41 N=1,500
C CALL GAUSS1(IA,EX,STD,AY)
C XETA(N)=AY
C 41 CONTINUE
C DD 40 N=1,500
C*****COMPUTE PROBABILITY OF RESPONSE *****/
C DD 30 J=1,30
C AXETA=XETA(N)
C AB=B(J)
C CALL POB(AXETA,AB,AX)
C DD 20 I=1,20
C CALL NORMAL(IB,EX,STD,Z)
C*****RESPONSE REPEATED 100 TIMES *****/
C IF(Z.GE.AX)GO TO 15
C IU(N,J,I)=1
C GO TO 20
C 15 IU(N,J,I)=0
C 20 CONTINUE
C 30 CONTINUE
C 40 CONTINUE
C***** WRITE RESPONSE EACH SAMPLES *****/
C DD 10 L=1,20
C I=0
C DD 50 N=1,500
C I=I+1
C WRITE(4,16)I,(IU(N,M,L),M=1,30),XETA(N)
C 16 FORMAT(2X,I3,2X,30(I1),2X,F7.3,34X)
C 50 CONTINUE
C END FILE 4
C REWIND 4
C CALL BICAL
C REWIND 4
C 10 CONTINUE
C WRITE(6,111)IB
C 111 FORMAT(10X,'SEED =',I10/)

```


STOP
END

C
C***** SUBROUTINE TO FIND PROBABILITY OF RESPONSE *****/

C
SUBROUTINE POB(AXETA,AB,AX)
C=EXP(AXETA-AB)
P=C/(1+C)
CALL NDTRI(P,X,D,IER)
AX=X
RETURN
END

C
C***** SUBROUTINE TO FIND Z-SCORES *****/

C
SUBROUTINE NDTRI(P,X,D,IE)
IE=0.
X=0.99999E+74
D=X
IF(P)1,4,2
1 IE=-1
GO TO 12
2 IF(P-1.0)7,5,1
4 X=-0.999999E+74
5 D=0.0
GO TO 12
7 D=P
IF(D-0.5)9,9,8
8 D=1.0-D
9 T2=ALOG(1.0/(D*D))
T=SQR(T2)
X=T-(2.515517+0.802853*T+0.010328*T²)/(1.0+1.432788*T+0.189269*T²+
*)0.001308*T*T²)
IF(P-0.5)10,10,11
10 X=-X
11 D=0.3989423*EXP(-X*X/2.0)
12 RETURN
END

C
C***** SUBROUTINE TO FIND NORMAL RANDOM NUMBER *****/

C
SUBROUTINE GAUSS1(IA,EX,STD,Z)
A=0.0
DO 5 I = 1,12
CALL RANDUM(IA,IY,RN)
IA=IY
5 A = A+RN
Z = EX+(STD)*(A-6.)
RETURN
END

C***** SUBROUTINE TO FIND NORMAL RANDOM NUMBER *****/

C
SUBROUTINE NORMAL(IA,EX,STD,Z)
A=0.0
DO 5 I = 1,12
CALL RANDUM(IA,IY,RN)
IA=IY



```

5 A = A+RN
Z = EX*(STD)*(A-30)
RETURN
EJD

```

C*****SUBROUTINE RAND IN NUMBER *****/

```

SUBROUTINE RANDUM(IX,IY,RN)
IY = IX*35533
IF(IY)5,5,6
5 IY = IY+2147483647+1
6 RN = IY
RN = RN*.4656613E-9
RETURN
EJD

```

C*****SUBROUTINE RASCH MODEL *****/

```

SUBROUTINE BICAL
DIMENSION ABIL(1000),DIFF(540),IB(100),IS(180),MATX(1300)
DIMENSION A(480),C(480),ID(130),IDATA(180),NSEL(1000),SHAME(130)
DIMENSION DLAB(180),ISEL(180),ISSW(180),SE(180),IZ(180),Z(180),
IALAB(12),ZLAB(12),XLAB(12),YLAB(12),SSW(180),SSW2(180),FSSW(180)
DIMENSION EX(180),PB(180),STAT(28),SEA(180),WLAB(12)
DATA YLAB/'F','I','T','I','T','I','T','E','S','T','I','I' /
DATA XLAB/'P','E','R','S','O','N','I','A','B','L','I','Y' /
DATA DLAB/'D','I','F','F','I','C','U','L','T','Y' /
DATA ALAB/'D','I','S','C','R','I','M','I','N','I','T','I','C','I','M' /
DATA ZLAB/'T','O','T','A','L','I','T','I','L','I','S','T' /
DATA WLAB/'B','E','T','W','I','T','I','T','E','S','T' /
COMMON NITEM,NGROP,MINSC,MAXSC,LREC,ISUBJ,IC,KCAB,ISW(11)
1,SHAME
COMMON/CFIT/CFIT
COMMON/MGRCP/ MGRCP
COMMON/DCK/XTMN,XTSD,LOOP,NDEL,NDEL1
COMMON/PLOTR/ YMIN,YMAX,XMIN,XMAX,NROW,NCOL
COMMON/MSUBJ/ MSUBJ,IBK
COMMON/PFIT/ PFITS,PFITSD
COMMON/FORM/ FMT(18),ZSTAR(130)
IBK = 0
NDEL = 0

```

```

C
1 WRITE(6,105)
CALL PAGE(1,J)
CALL REDDP(IDATA,IB,IS,ISEL,A,C,DIFF)
LOOP = 6

```

```

4
NDEL1 = NDEL
IF(NDEL.GT.0)CALL PAGE(2,J)
CALL EDITD(IB,IS,ISEL,MATX)
CALL ESTIM(IS,IB,DIFF,SE,ABIL,ISEL,MATX,KCAB,SEA)
CALL NEWTAB (ABIL,IB,DIFF,0.2,ISEL,MATX(NITEM+1))
CALL PAGE(5,J)

```

```

105 FORMAT(1H1//////////50X,38(' ')//50X,'* * * * * R A S C H M O D E L
1* * * * * //50X,'* * * B I C A L - V E R S I O N 3' * * *
2//50X,38(' ')//63X,'I M P L E M E N T E D'//68X,'B Y'//60X,'S U P H A T S U K A M O L S O N
3'//67X,'C U L I'//57X,'C H U L A L O N G K O R N U N I V E R S I T Y'//67X,'1983')

```

```

RETURN
END
SUBROUTINE ABLTY(AB,D,SEC,SE,IB,ISEL,1,SEA)
DIMENSION AB(1),D(1),SEC(1),SE(1),ISEL(1),IB(1),SEA(1)
COMMON NITEM,NGROP,MINSC,MAXSC,LREC,ISUBJ,IC,KCAB,ISW(11)
1,SHAME(1)

```

```

/BAAKSKNI      JOB CLASS=T,MSO LEVEL=(1,1),TYPRUN=H:GLD
/              EXLC  FORTVCLG, FVSDJRC='NOSOURCE',FVSRCLF='NCSRCFLG'
/FORT.SYSIN    DD *
*****
PROGRAM SIMULATION TO FIND PARAMETERS OF ITEM DIFFICULTY(B)
              OF RASCH MODEL
              WHEN POPULATION ARE NEGATIVE SKEW
STATISTICAL OF SAMPLES:
              MEAN =1.995      VARIANCE = 0.993
              SKEWNESS =-0.928  KURTOSIS = 3.07
*****
DIMENSION XETA(500),B(30),IU(500,30,20)
DATA 3/-4.0000,-3.7241,-3.4482,-3.1724,-2.8965,-2.6206,-2.3448,-2.
*0.89,-1.7931,-1.5172,-1.2413,-0.9655,-0.6896,-0.4137,-0.137),0.137
*9,0.4137,0.6896,0.9655,1.2413,1.5172,1.7931,2.0689,2.3448,2.6206,2
*.8965,3.1724,3.4482,3.7241,4.0000/
IA=65539
IB=65539
EX=0.
STD=1.0
***** CALL XETA TO FIND SAMPLES *****/
A=2.345
B1=1.1605091
C=-0.2710708
D=-0.0928190
JJ 41 N=1,500
CALL GAUSSI(IA,EX,STD,AY)
X1=B1*AY
X2=C*(AY**2)
X3=D*(AY**3)
XE=A+X1+X2+X3
XETA(J)=XE
41 CONTINUE
DO 40 N=1,500
***** COMPUTE PROBABILITY OF RESPONSE *****/
DO 30 J=1,30
AXETA=XETA(N)
AB=B(J)
CALL PUB(AXETA,AB,AX)
DO 20 I=1,20
CALL NORMAL(1B,EX,STD,Z)
*****RESPONSE REPEATED 100 TIMES *****/
IF(Z.GE.AX)GO TO 15
IU(N,J,I)=1
GO TO 20
15 IU(N,J,I)=0
20 CONTINUE
30 CONTINUE
40 CONTINUE
***** WRITE RESPONSE EACH SAMPLES *****/
DO 10 L=1,20
I=0
DO 50 N=1,500
I=I+1
WRITE(4,16)I,(IU(N,I,L),M=1,30),XETA(I)
16 FORMAT(2X,13,2X,30(I1),2X,F7.3,34X)

```

```

50 CONTINUE
END FILE 4
REWIND 4
CALL BTICAL
REWIND 4

```

```

10 CONTINUE
WRITE(6,555)IB

```

```

555 FORMAT(10X,'SEED =',I10)
STOP
END

```

```

C*****SUBROUTINE TO FIND POPABILITY *****/

```

```

SUBROUTINE PUB(AXETA,AB,AX)
C=EXP(AXETA-AB)
P=C/(1+C)
CALL NDTRI(P,X,D,IER)
AX=X
RETURN
END

```

```

C*****SUBROUTINE TO FIND Z-SCORES *****/

```

```

SUBROUTINE NDTRI(P,X,D,IE)
IE=0.
X=0.99999E+74
D=X
IF(P)1,4,2
1 IE=-1
GO TO 12
2 IF(P-1.0)7,5,1
4 X=-0.99999E+74
5 D=0.0
GO TO 12
7 J=P
IF(D-0.5)9,9,8
8 D=1.0-D
9 T2=ALOG(1.0/(D*D))
T=SQRT(T2)
X=T-(2.515517+0.802353*T+0.010328*T2)/(1.0+1.432780*T+0.189269*T2+
*0.001308*T*T2)
IF(P-0.5)10,10,11
10 X=-X
11 D=0.3989423*EXP(-X*X/2.0)
12 RETURN
END

```

```

C*****SUBROUTINE TO FIND NORMAL RANDOM NUMBER *****/

```

```

SUBROUTINE GAUSSI(IA,EX,STD,Z)
A=0.0
DO 5 I = 1,12
CALL RANDUM(IA,IY,RN)
IA=IY
5 A = A+RN
Z = EX+(STD)*(A-6.)
RETURN
END

```

```

C*****SUBROUTINE TO FIND NORMAL RANDOM NUMBER *****/

```

```

SUBROUTINE NORMAL(IA,EX,STD,Z)
A=0.0
DO 5 I = 1,12
CALL RANDUM(IA,IY,RN)

```

```

IA=IY
5 A = A+RN
Z = EX+(STD)*(A-6.)
RETURN
END

```

C*****SUBROUTINE RANDOM NUMBER *****/

```

SUBROUTINE RANDOM(IX,IY,RN)
IY = IX*65539
IF(IY)5,5,6
5 IY = IY+2147483647+1
6 RI = IY
RN = RI*4655613E-9
RETURN
END

```

C*****SUBROUTINE RASCH MODEL *****/

```

SUBROUTINE BICAL
DIMENSION ABIL(1000),DIFF(540),IB(1000),IS(180),MATX(1800)
DIMENSION A(480),C(480),ID(180),IDATA(180),NSEL(1000),SHAME(180)
DIMENSION DLAB(180),ISEL(180),ISSW(180),SE(180),TZ(180),Z(180),
IALAB(12),ZLAB(12),XLAB(12),YLAB(12),SCW(180),SSW(180),FSSW(180)
DIMENSION EX(180),PB(180),STAT(28),SEA(180),WLAB(12)
DATA YLAB/'I','I','T','I','T','I','T','E','S','T','I','I'/'
DATA XLAB/'P','E','R','S','I','N','I','A','B','L','T','Y'/'
DATA DLAB/'D','I','F','F','I','C','J','L','T','Y'/'
DATA ALAB/'D','I','S','C','R','I','M','I','N','T','I','C','N'/'
DATA ZLAB/'T','D','T','A','L','T','I','I','E','S','T'/'
DATA JLAB/'B','E','T','U','I','T','I','E','S','T'/'
COMMON NITEM,NGROP,MINSC,MAXSC,LREC,ISUBJ,IC,KCAB,ISW(11)

```

```

1,SHAME
COMMON IZCFITZCFIT
COMMON I/NGROP/ NGROP
COMMON I/DCK/XTHN,XTSD,LDJP,NDEL,NDEL1
COMMON I/PLCTR/ YMIN,YMAX,XMIN,XMAX,NROW,NCOL
COMMON I/MSUBJ/ MSUBJ,IBK
COMMON I/PEIT/ PEITS,PEITSD
COMMON I/FORM/ FMT(18),ZSTAR(180)
IBK = 0
NDEL = 0

```

```

C
1 CALL PAGE(1,J)
CALL REDOP(IDATA,IB,IS,ISEL,A,C,DIFF)
LDJP = 6
4 NDEL1 = NDEL
IF(NDEL.GT.0)CALL PAGE(2,J)
CALL EDITD(IB,IS,ISEL,MATX)
CALL ESTIM(IS,IB,DIFF,SE,ABIL,ISEL,MATX,KCAB,SEA)
CALL NEWTAB (ABIL,IB,DIFF,0.2,ISEL,MATX(NITEM+1))
CALL PAGE(5,J)

```

```

105 FORMAT(1H1//////////50X,3B('**')//50X,'*****RASCH MODEL
1*****' //50X,'*****BICAL-VERSION 3**'
2//50X,3B('**')//63X,'IMPLEMENTED'//68X,'BY'//60X,'SUPHAT SUKAMOLSON
3'//67X,'COL1'//57X,'CHULALONGKORN UNIVERSITY'//67X,'1983')
RETURN

```

```

END
SUBROUTINE ABLTY(AB,D,SEC,SE,IB,ISEL,M,SEA)
DIMENSION AB(1),D(1),SEC(1),SE(1),ISEL(1),IB(1),SEA(1)
COMMON NITEM,NGROP,MINSC,MAXSC,LREC,ISUBJ,IC,KCAB,ISW(11)

```

ประวัติผู้เขียน

นายสมพร บุญอ้อม เกิดวันที่ 1 พฤศจิกายน พ.ศ. 2498 ที่จังหวัด
 สิงห์บุรี สำเร็จการศึกษาปริญญาการศึกษามัธยมศึกษา วิชาเอกฟิสิกส์ จากมหาวิทยาลัย
 ศรีนครินทรวิโรฒ วิทยาเขตบางเขน เมื่อปีการศึกษา 2522 เข้าศึกษาต่อสาขา-
 วิชาการวัดและประเมินผลการศึกษาภาควิชาวิจัยการศึกษา มัธยมศึกษาวิทยาลัย
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ศูนย์วิทยทรัพยากร
 จุฬาลงกรณ์มหาวิทยาลัย