CAIMSGUZ User's Guide

1. Description

CAIMSGUZ is a FORTRAN77 program that **computes analytically the adverse impact and the expected quality of a multi-stage selection given the stage-specific selection rates.** In particular, the program addresses the multi-stage **pre-reject** selection decision in which P **elementary** predictors are available to screen the candidates and the criterion behaviour is a predefined, weighed combination of criterion dimensions such as, for example, task performance and contextual performance. **The program is adapted to handle uncertainty with respect to the values of the predictor effect sizes, validities and intercorrelations as well as the criterion effect sizes and intercorrelations. To deal with the uncertainty, the computations are repeated, each time using another sample of values for the uncertain parameters. Sampling from appropriate rectangular or normal distributions is available. The sample generator is in a non-repeatable state, so that different runs, starting from the same input file, will produce slightly different results in case that ISRAN (see below) is not equal to 0**.

2. Assumptional Basis

CAIMSGUZ assumes that the decision to select a candidate is based on stage-specific **composite** predictors which are user-specified weighted combinations of either all the thusfar administered predictors or of the predictors that were administered in the stage. The calculations are based on the assumption that the predictor and (eventually) the criterion dimensions have a joint multivariate normal distribution with the same variance/covariance matrix but a different mean vectors in the different applicant populations. Given this assumption it is, without further restrictions, understood that the joint distribution of the predictors and the criterion dimensions is standard multivariate normal in the first applicant population. It is also understood that the **last** applicant population serves as the basis for the values of the predictor and criterion effect sizes (i.e., the effect sizes are all equal to zero for this group). Finally, **the computation of the adverse impact ratios assumes that the last applicant group is the majority applicant group.**

3. Technical Aspects

The program can handle selections with up to 4 stages, 5 different applicant populations, 3 criterion dimensions and 10 elementary predictors. A maximum of 100,000 samples is possible. To safely run the compiled program, a PC running under MS-Windows 95, 98, NT or 2000 and with at least 128 MB RAM memory is required. Execution times typically are between 1 and several hundreds of CPU seconds on a Pentium 4, 3.2 Ghz

machine, depending on the number of samples.

4. Input

Observe that all input is in free format: Variables or vectores that have a name commencing with the letters I, J, K, L, M, N get INTEGER values (i.e., no decimal point). All other variables, vectors and matrices get FLOATING POINT values. The number of blanks between consecutive values on a line (record) can be freely chosen.

- # 1: **ISRAN, NLSA, NC, NF, NP, NGR, PGR(I) (with I = 1, NGR)**

    - ISRAN: the values are sampled from rectangular (ISRAN = 2) or normal distributions (ISRAN = 1). If ISRAN = 0 and NLSA = 1 only one run is performed and no upper bound values or standard deviations of the data input variables must be specified.

    - NLSA: the number of samples ($100 <$ NLSA < 100000 when ISRAN equals 1 or 2; when ISRAN equals 0, NLSA must be set equal to 1)

    - NC: number of criterion dimensions (NC ≤ 5)

    - NF: number of selection stages (NF ≤ 4)

    - NP: total number of predictors (NP ≤ 10)

    - NGR: number of different applicant populations (NGR ≤ 5)

    - (PGR(I), I = 1, NGR): vector with the proportional representation of the different applicant groups in the total applicant pool. **Observe that PGR(1) + ... + PGR(NGR) must be equal to 1**.

- # 2: **RETR(I)** (with I = 1, NF)
  RETR(I) indicates the retention rate at the end of the Ith selection stage.

- # 3 and following: **WEIVAL(I,J)** (with I = 1, NF and J = 1, NP).
  The element WEIVAL(I,J) indicates the weight with which the Jth elementary predictor is used to compose the Ith stage-specific composite predictor.

- # 4 and following: **DIFC1(K, I)** (with K = 1, NGR and I = 1, NC) and **DIFP1(K, I)** (with K = 1, NGR and I = 1, NP)

    - DIFC1(K, I): the effect size of the Ith criterion dimension in the Kth applicant group (the last applicant serves as the basis)

    - DIFP1(K, I): the effect size of the Ith elementary predictor in the Kth applicant group (the last population is the basis)

When ISRAN = 2, DIFC1(K, I) and DIFP1(K, I) indicate the **lower bound** value of the effect size.

When ISRAN = 1, DIFC1(K, I) and DIFP1(K, I) indicate the **mean value** of the effect size.

When ISRAN = 0, DIFC1(K, I) and DIFP1(K, I) simply indicate the value of the effect size.

- # 5 and following: **DIFC2(K, I)** (with K = 1, NGR and I = 1, NC) and **DIFP2(K, I)** (with K = 1, NGR and I = 1, NP).
  When ISRAN = 2, DIFC2(K, I) and DIFP2(K, I) indicate the **upper bound** value of the effect size.
  When ISRAN = 1, DIFC2(K, I) and DIFP2(K, I) indicate the **standard deviation** of the effect size.
  When ISRAN = 0, DIFC2(K, I) and DIFP2(K, I) must not be set!

- # 6: **WC(I)** (with I = 1, NC)
  WC(I) represents the weight with which the Ith criterion dimension contributes to the overall criterion.

- # 7 and following: **CC1(I,J)** (with both I and J = 1, NC).
  CC1(I,J) indicates the correlation between the Ith and the Jth criterion dimension. Only the strict upper triangle of the correlation matrix is required!
  When ISRAN = 2, CC1(I,J) refers to the **lower bound** value of the correlation.
  When ISRAN = 1, CC1(I,J) refers to the **mean value** of the correlation.
  When ISRAN = 0, CC1(I,J) simply refers to the value of the correlation.

- # 8 and following: **CC2(I,J)** (with both I and J = 1, NC).
  Only the strict upper triangle is required!
  When ISRAN = 2, CC2(I,J) refers to the **upper bound** value that corresponds to the above specified lower bound value CC1(I,J) of the correlation.
  When ISRAN = 1, CC2(I,J) refers to the **standard deviation** of the above specified mean correlation CC1(I,J).
  When ISRAN = 0, CC2(I,J) must not be set!

- # 9 and following: **PC1(I,J)** (with both I and J = 1, NP).
  PC1(I,J) indicates the correlation between the Ith and the Jth elementary predictor. Only the strict upper triangle of the correlation matrix is required!
  When ISRAN = 2, PC1(I,J) refers to the **lower bound** value of the correlation.
  When ISRAN = 1, PC1(I,J) refers to the **mean value** of the correlation.
  When ISRAN = 0, PC1(I,J) simply refers to the value of the correlation.

- # 10 and following: **PC2(I,J)** (with both I and J = 1, NP).
  Only the strict upper triangle is required!
  When ISRAN = 2, PC2(I,J) refers to the **upper bound** value that corresponds to the above specified lower bound value PC1(I,J) of the correlation.
  When ISRAN = 1, PC2(I,J) refers to the **standard deviation** of the above specified mean correlation PC1(I,J).
  When ISRAN = 0, PC2(I,J) must not be set!

- # 11 and following: **PV1(I,J)** (with I = 1, NC and J = 1, NP).
  PV1(I,J) indicates the validity of the Jth elementary predictor with respect to the Ith criterion dimension.
  When ISRAN = 2, PV1(I,J) refers to the **lower bound** value of the validity.
  When ISRAN = 1, PV1(I,J) refers to the **mean value** of the validity. When ISRAN = 0, PC1(I,J) simply refers to the value of the validity.

- # 12 and following: **PV2(I,J)** (with I = 1, NC and J = 1, NP).
  When ISRAN = 2, PV2(I,J) refers to the **upper bound** value that corresponds to the above specified lower bound value PV1(I,J) of the validity.
  When ISRAN = 1, PV2(I,J) refers to the **standard deviation** of the above specified mean validity PV1(I,J).
  When ISRAN = 0, PV2(I,J) must not be set!

5. Sample Input File

Important: in preparing the input file, use a simple text editor such as Notepad, Wordpad or any other standard ASCII producing editor. DO NOT USE TEXT PROCESSING PROGRAMS SUCH AS MS-WORD or WORDPERFECT. Also, when saving the input file in Notepad, use the option "All Files" in the "Save as type" box. When saving in Wordpad, use the "Text Document-MS-DOS Format" option in the "Save as type" box, and be **aware that Wordpad has the nasty habit of adding the extension .txt to the file name that you specify**. Thus, with Wordpad, if you specify the name of the input file as "MINPUT", the file will in fact be saved as "MINPUT.TXT"; and this is the name that you have to use in the command to run the present programs. Here is a first sample input file, for the `caimsguz` program. The input file specifies an analysis without the Monte Carlo feature (i.e., ISRAN equals 0).

```
0 1 2 3  4 3  0.20 0.10 0.70
 0.6  0.3  0.10
 0.100  0.000  0.000  0.000
 0.000  0.319  0.223  0.000
 0.000  0.000  0.000  0.254
 -0.450   0.070  -0.330  -1.000  -0.090  -0.230
```

```
  0.100    0.020   -0.230    0.200   -0.080   -0.130
 0.00  0.   0.   0.   0.   0.
 3.000  1.000
 0.170
 0.190    0.510   0.160
 0.000    0.240
 0.120
 0.280  0.300  0.180  0.300
 0.250  0.160  0.200  0.260
```

Next, a second input file for an analysis where the uncertain parameter values are sampled from **normal distributions**

```
 1  1000  2  3  4  2  0.20 0.80
  0.5 0.4 0.200
  0.0  1.0  0.0  0.0
  0.0  0.0  1.0  0.0
  0.0  0.0  0.0  1.0
  -0.450    0.070  -0.330  -1.000  -0.090  -0.230
  0.00  0.   0.   0.   0.   0.
  0.070    0.060  0.080  0.250  0.090    0.070
  0.00  0.   0.   0.   0.   0.
  1.0  0.0
  0.170
  0.160
  0.190    0.510   0.160
  0.000    0.240
  0.120
  0.050    0.100   0.070
  0.060    0.050
  0.120
  0.280  0.300  0.180  0.300
  0.250  0.160  0.200  0.260
  0.070  0.080  0.040  0.040
  0.070  0.080  0.090  0.040
```

6. Running the Program

Suppose you copied the executable source of the program to the `d:ssel` directory on your machine. In that case, the input file must also be saved in the `d:ssel` directory. Next, to run the program, you have to open an MS-DOS Command window. The way to do this varies from one operating system (i.e., Windows 95, 98, NT a.s.o.) to the other, and you should use your local "HELP" button when in doubt about this feature.

In the MS-DOS Command window you type `d:`, followed by RETURN or ENTER, and your computer will return the `D:\>` command prompt. Next, you type `cd ssel` after the `D:\>` command prompt, again followed by RETURN or ENTER, and your computer will respond with the `D:\ssel>` command prompt. Now, you can execute the program

by typing `caimsguz < minput > moutput`   where "minput" is the name of the input file and "moutput" is the name of the output file. At the end of the execution, the PC will return the command prompt `D:\ssel>`. You can then inspect the output by editing the output file with either Notepad, Wordpad or any other simple editor program.

7. Sample Output

The first output corresponds to the first analysis, the second to the input file where the values of the selection parameters are uncertain and sampling occurs from normal distributions.

```
Program execution starts on 25/ 5/2005 at 17:37:43

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                        +  CAIMSGUZ  +
                        +++++++++++++


Analytical computation of the selection quality and the
adverse impact of MULTI-STAGE selection decisions, given the
stage-specific predictor weights and retention rates.
Adapted to uncertainty in the available estimates of the
predictor correlations, validities and effect sizes as well
of the criterion correlations and effect sizes.
The selection criterion behaviour (i.e., job performance)
may be multi-dimensional.

Program written by Wilfried De Corte, Ghent University, Belgium

The program uses routines from the Slatec library (see
http://www.geocities.com/Athens/Olympus/5564), a couple
of algorithms from StatLib (see http://lib.stat.cmu.edu/apstat/),
and some (adapted) code from Genz to evaluate multivariate normal
probabilities (cf. http://www.math.wsu.edu/math/faculty/genz/homepage)
At present, the program is limited to 4 stages, 3 criteria,
10 predictors and 5 different applicant groups.

PROBLEM SPECIFICATION

Exact computation---extended output

Number of selection stages:  3
Number of criterion dimensions:  2
Number of available predictors:  4
Number of different applicant groups:  3
Weights used to combine the individual criterion
dimensions to the composite criterion are:   3.000   1.000

Proportional representation applicant groups:
            0.200     0.100     0.700
```

```
Correlation matrix of the criterion dimensions.
  Criterion 1    1.000  0.170
  Criterion 2    0.170  1.000


Correlation matrix of the predictors.
  Predictor  1    1.000  0.190  0.510  0.160
  Predictor  2    0.190  1.000  0.000  0.240
  Predictor  3    0.510  0.000  1.000  0.120
  Predictor  4    0.160  0.240  0.120  1.000


Validities of the predictors (columns) with respect
to the criterion dimensions (rows).
  Criterion 1    0.280  0.300  0.180  0.300
  Criterion 2    0.250  0.160  0.200  0.260


Effect sizes selection predictors (Last group is base).
  Group 1:  -0.330 -1.000 -0.090 -0.230
  Group 2:  -0.230  0.200 -0.080 -0.130
  Group 3:   0.000  0.000  0.000  0.000


Effect sizes criterion dimensions (Last group is base).
  Group 1:  -0.450  0.070
  Group 2:   0.100  0.020
  Group 3:   0.000  0.000


Predictor weights from predictor 1 onwards are fixed
as follows in each of the stages
  Stage 1 :  0.100  0.000  0.000  0.000
  Stage 2 :  0.000  0.319  0.223  0.000
  Stage 3 :  0.000  0.000  0.000  0.254


Fixed retention rates in the  3 stages
Retention rate stage 1 must be equal to   0.600
Retention rate stage 2 must be equal to   0.300
Retention rate stage 3 must be equal to   0.100

COMPUTATION RESULTS OVERVIEW


    Stage   Group   Quality   Cum. AI   Stage AI
      1       1     -0.058     0.797     0.797
      1       2      0.397     0.859     0.859
      1       3      0.259     1.000     1.000
      2       1      0.356     0.344     0.432
      2       2      0.590     0.977     1.137
      2       3      0.492     1.000     1.000
      3       1      0.656     0.320     0.930
      3       2      0.921     0.834     0.854
      3       3      0.793     1.000     1.000
    Quality all selected per stage:   0.218   0.492   0.795
```

Effect sizes stage-specific predictor composites before stage 1

	Group 1	Group 2	Group 3	Group 4	Group 5
Stage 1 Predictor composite	-0.330	-0.230	0.000		
Stage 2 Predictor composite	-0.871	0.118	0.000		
Stage 3 Predictor composite	-0.230	-0.130	0.000		

Effect size stage 2 predictor composite after stage 1 selection

Group 1	Group 2	Group 3	Group 4	Group 5
-0.783	0.178	0.000		

Predictor effect sizes after stage 1 selection

	Group 1	Group 2	Group 3	Group 4	Group 5
Predictor 1	-0.134	-0.096	0.000		
Predictor 2	-0.963	0.225	0.000		
Predictor 3	0.010	-0.012	0.000		
Predictor 4	-0.199	-0.109	0.000		

Effect size stage 3 predictor composite after stage 2 selection

Group 1	Group 2	Group 3	Group 4	Group 5
-0.063	-0.137	0.000		

Predictor effect sizes after stage 2 selection

	Group 1	Group 2	Group 3	Group 4	Group 5
Predictor 1	-0.033	-0.138	0.000		
Predictor 2	-0.489	0.133	0.000		
Predictor 3	0.275	-0.072	0.000		
Predictor 4	-0.063	-0.137	0.000		

Predictor effect sizes after stage 3 selection

	Group 1	Group 2	Group 3	Group 4	Group 5
Predictor 1	-0.044	-0.137	0.000		
Predictor 2	-0.520	0.156	0.000		
Predictor 3	0.252	-0.068	0.000		
Predictor 4	-0.021	-0.037	0.000		

Average expected quality of a selected applicant
after stage 1 over the   1 samples is 0.2178
whereas the average Cum. AI values for the groups are
          0.797   0.859   1.000

Average expected quality of a selected applicant
after stage 2 over the   1 samples is 0.4922
whereas the average Cum. AI values for the groups are
          0.344   0.977   1.000

Average expected quality of a selected applicant

```
after stage 3 over the       1 samples is  0.7949
whereas the average Cum. AI values for the groups are
              0.320    0.834    1.000


CPU TIME IN SECONDS            0.00



Program execution starts on 25/ 5/2005 at 17:44:53


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Analytical computation of the selection quality and the
adverse impact of MULTI-STAGE selection decisions, given the
stage-specific predictor weights and retention rates.
Adapted to uncertainty in the available estimates of the
predictor correlations, validities and effect sizes as well
of the criterion correlations and effect sizes.
The selection criterion behaviour (i.e., job performance)
may be multi-dimensional.

Program written by Wilfried De Corte, Ghent University, Belgium

The program uses routines from the Slatec library (see
http://www.geocities.com/Athens/Olympus/5564), a couple
of algorithms from StatLib (see http://lib.stat.cmu.edu/apstat/),
and some (adapted) code from Genz to evaluate multivariate normal
probabilities (cf. http://www.math.wsu.edu/math/faculty/genz/homepage)
At present, the program is limited to 4 stages, 3 criteria,
10 predictors and 5 different applicant groups.

PROBLEM SPECIFICATION

Number of selection stages:  3
Number of criterion dimensions:  2
Number of available predictors:  4
Number of different applicant groups:  2
Weights used to combine the individual criterion
dimensions to the composite criterion are:   1.000   0.000
Sampling of uncertain problem variables is from
appropriate normal distributions
Number of Monte Carlo samples is  1000


Proportional representation applicant groups:
  First row contains expected values, whereas
  the second contains the standard deviations
  for the corresponding elements
              0.200    0.800
```

```
              0.000     0.000


Correlation matrix of the criterion dimensions.
  First matrix contains expected values, whereas
  the second contains the standard deviations
  for the corresponding elements
  Criterion 1     1.000  0.170
  Criterion 2     0.170  1.000


  Criterion 1     1.000  0.160
  Criterion 2     0.160  1.000


Correlation matrix of the predictors.
  First matrix contains expected values, whereas
  the second contains the standard deviations
  for the corresponding elements
  Predictor  1    1.000  0.190  0.510  0.160
  Predictor  2    0.190  1.000  0.000  0.240
  Predictor  3    0.510  0.000  1.000  0.120
  Predictor  4    0.160  0.240  0.120  1.000


  Predictor  1    1.000  0.050  0.100  0.070
  Predictor  2    0.050  1.000  0.060  0.050
  Predictor  3    0.100  0.060  1.000  0.120
  Predictor  4    0.070  0.050  0.120  1.000


Validities of the predictors (columns) with respect
to the criterion dimensions (rows).
  First matrix contains expected values, whereas
  the second contains the standard deviations
  for the corresponding elements
  Criterion 1     0.280  0.300  0.180  0.300
  Criterion 2     0.250  0.160  0.200  0.260


  Criterion 1     0.070  0.080  0.040  0.040
  Criterion 2     0.070  0.080  0.090  0.040


Effect sizes selection predictors (Last group is base).
  First matrix contains expected values, whereas
  the second contains the standard deviations
  for the corresponding elements
  Group 1:  -0.330 -1.000 -0.090 -0.230
  Group 2:   0.000  0.000  0.000  0.000


  Group 1:   0.080  0.250  0.090  0.070
  Group 2:   0.000  0.000  0.000  0.000


Effect sizes criterion dimensions (Last group is base).
  First matrix contains expected values, whereas
  the second contains the standard deviations
```

```
   for the corresponding elements
   Group 1:  -0.450  0.070
   Group 2:   0.000  0.000


   Group 1:   0.070  0.060
   Group 2:   0.000  0.000


Predictor weights from predictor 1 onwards are fixed
as follows in each of the stages
   Stage 1 :  0.000  1.000  0.000  0.000
   Stage 2 :  0.000  0.000  1.000  0.000
   Stage 3 :  0.000  0.000  0.000  1.000


Fixed retention rates in the  3 stages
Retention rate stage 1 must be equal to   0.500
Retention rate stage 2 must be equal to   0.400
Retention rate stage 3 must be equal to   0.200


COMPUTATION RESULTS OVERVIEW


Monte Carlo sample number      1
   Stage   Group   Quality   Cum. AI    Stage AI
      1       1     -0.061     0.298       0.298
      1       2      0.170     1.000       1.000
      2       1      0.004     0.281       0.942
      2       2      0.224     1.000       1.000
      3       1      0.202     0.291       1.035
      3       2      0.435     1.000       1.000
    Quality all selected per stage:   0.154   0.209   0.419


Monte Carlo sample number      2
   Stage   Group   Quality   Cum. AI    Stage AI
      1       1     -0.068     0.450       0.450
      1       2      0.254     1.000       1.000
      2       1     -0.012     0.452       1.005
      2       2      0.310     1.000       1.000
      3       1      0.185     0.466       1.031
      3       2      0.521     1.000       1.000
    Quality all selected per stage:   0.222   0.277   0.486


Monte Carlo sample number      3
   Stage   Group   Quality   Cum. AI    Stage AI
      1       1      0.055     0.430       0.430
      1       2      0.313     1.000       1.000
      2       1      0.094     0.439       1.023
      2       2      0.356     1.000       1.000
      3       1      0.340     0.412       0.937
      3       2      0.595     1.000       1.000
    Quality all selected per stage:   0.288   0.330   0.571
```

```
!!! LINES DELETED    LINES DELETED    LINES DELETED !!!
```

Monte Carlo sample number   994

Stage	Group	Quality	Cum. AI	Stage AI
1	1	-0.054	0.460	0.460
1	2	0.241	1.000	1.000
2	1	0.000	0.456	0.991
2	2	0.294	1.000	1.000
3	1	0.227	0.411	0.901
3	2	0.505	1.000	1.000

Quality all selected per stage: 0.211   0.264   0.479

Monte Carlo sample number   995

Stage	Group	Quality	Cum. AI	Stage AI
1	1	0.127	0.262	0.262
1	2	0.247	1.000	1.000
2	1	0.187	0.254	0.970
2	2	0.302	1.000	1.000
3	1	0.401	0.249	0.978
3	2	0.519	1.000	1.000

Quality all selected per stage: 0.239   0.295   0.512

Monte Carlo sample number   996

Stage	Group	Quality	Cum. AI	Stage AI
1	1	-0.027	0.476	0.476
1	2	0.320	1.000	1.000
2	1	0.035	0.453	0.952
2	2	0.374	1.000	1.000
3	1	0.222	0.449	0.990
3	2	0.567	1.000	1.000

Quality all selected per stage: 0.283   0.339   0.533

Monte Carlo sample number   997

Stage	Group	Quality	Cum. AI	Stage AI
1	1	0.413	0.089	0.089
1	2	0.315	1.000	1.000
2	1	0.464	0.090	1.011
2	2	0.368	1.000	1.000
3	1	0.615	0.103	1.149
3	2	0.569	1.000	1.000

Quality all selected per stage: 0.317   0.370   0.570

Monte Carlo sample number   998

Stage	Group	Quality	Cum. AI	Stage AI
1	1	0.137	0.332	0.332
1	2	0.341	1.000	1.000
2	1	0.173	0.339	1.022
2	2	0.382	1.000	1.000
3	1	0.405	0.321	0.947
3	2	0.612	1.000	1.000

```
     Quality all selected per stage:    0.325    0.366    0.596


Monte Carlo sample number      999
   Stage    Group    Quality    Cum. AI    Stage AI
      1        1       -0.011      0.340       0.340
      1        2        0.233      1.000       1.000
      2        1        0.044      0.342       1.007
      2        2        0.290      1.000       1.000
      3        1        0.243      0.358       1.044
      3        2        0.507      1.000       1.000
     Quality all selected per stage:    0.214    0.271    0.485


Monte Carlo sample number     1000
   Stage    Group    Quality    Cum. AI    Stage AI
      1        1       -0.096      0.454       0.454
      1        2        0.214      1.000       1.000
      2        1       -0.035      0.456       1.004
      2        2        0.275      1.000       1.000
      3        1        0.113      0.450       0.987
      3        2        0.426      1.000       1.000
     Quality all selected per stage:    0.182    0.244    0.394
```

Average expected quality of a selected applicant
after stage 1 over the   1000 samples is 0.2739
whereas the average Cum. AI values for the groups are
            0.368   1.000

Selected percentile values of the "sampling
distribution" of the expected quality of the selected

1	5	10	25	50	75	90	95	99
0.142	0.179	0.198	0.235	0.274	0.311	0.346	0.366	0.413

Selected percentile values of the "sampling
distribution" of the group specific Cum. AI ratio values
For group 1

1	5	10	25	50	75	90	95	99
0.155	0.201	0.232	0.286	0.359	0.441	0.513	0.566	0.687

For group 2

1	5	10	25	50	75	90	95	99
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Average expected quality of a selected applicant
after stage 2 over the   1000 samples is 0.3360
whereas the average Cum. AI values for the groups are
            0.356   1.000

Selected percentile values of the "sampling
distribution" of the expected quality of the selected

```
         1         5        10        25        50        75        90        95        99
     0.193     0.240     0.258     0.296     0.336     0.375     0.411     0.434     0.487
```

Selected percentile values of the "sampling
distribution" of the group specific Cum. AI ratio values
For group 1
```
         1         5        10        25        50        75        90        95        99
     0.151     0.195     0.223     0.274     0.348     0.425     0.503     0.539     0.657
```
For group 2
```
         1         5        10        25        50        75        90        95        99
     1.000     1.000     1.000     1.000     1.000     1.000     1.000     1.000     1.000
```


Average expected quality of a selected applicant
after stage 3 over the   1000 samples is   0.5342
whereas the average Cum. AI values for the groups are
```
              0.337      1.000
```

Selected percentile values of the "sampling
distribution" of the expected quality of the selected
```
         1         5        10        25        50        75        90        95        99
     0.395     0.433     0.459     0.495     0.534     0.571     0.612     0.631     0.679
```

Selected percentile values of the "sampling
distribution" of the group specific Cum. AI ratio values
For group 1
```
         1         5        10        25        50        75        90        95        99
     0.146     0.200     0.223     0.268     0.328     0.399     0.454     0.493     0.568
```
For group 2
```
         1         5        10        25        50        75        90        95        99
     1.000     1.000     1.000     1.000     1.000     1.000     1.000     1.000     1.000
```

CPU TIME IN SECONDS   4.27

8. Description of Output

The output is self-explanatory.

9. Dependencies and Acknowledgement

The present program is written in Fortran77. It was compiled to an executable code
for WIN32 PCs (ie, Windows 95/98/ME/XP or NT/2000) with the GNU Fortran G77
compiler (cf. http://www.geocities.com/Athens/Olympus/5564/). The program
uses routines from the SLATEC program library (cf. Fong et a., 1993; http://www.geocities.
com/Athens/Olympus/5564/), a couple of algorithms from StatLib http://lib.stat.
cmu.edu/apstat/), and some (adapted) code from Genz to evaluate multivariate normal
probabilities (cf. http://www.math.wsu.edu/math/faculty/genz/homepage).

**When the user reports results obtained by the present program, due refer-
ence should be made to De Corte (2005) and/or De Corte, Lievens, & Sackett**

(2006).

10. References

De Corte, W. (2005). CAIMSGUZ User's Guide.

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Fong, K. W., Jefferson, T. H., Suyehiro, & Walton, L. (1993). Guide to the SLATEC common mathematical library (`http://www.netlib.org/slatec/`).