Analysis of three tests containing items with two and three categories: calculation of combined scores

A partial credit model based on artificial data is discussed in this example. Six items, with either 2 or 3 categories each, are assigned to three subtests. In all cases, guessing parameters are estimated.

The data file used is **exampl06.dat** in the **examples** subfolder of the PARSCALE installation. The first few lines of the data file are shown below.

```
0001 113211 -1.98194
0002 222211   .07151
0003 222211  -.06528
0004 211221  -.72716
0005 222211  -.35792
0006 323212   .73036
0007 212212  -.53729
0008 211211 -1.40260
0009 221212   .09829
0010 122111  -.75451
```

The case identification is given in the first four columns of each line. Responses to the six items are recorded in columns 6 to 11. At the end of each line, the generating trait value is given. This value is not used in the analysis. The format statement used to read these data is:

```
(4A1,1X,6A1)
```

The items are analyzed in different ways in three subtests (NTEST=3 on INPUT). The LENGTH keyword on the INPUT command indicates the length of each of the three subtests. The COMBINE keyword on the INPUT command indicates that 3 COMBINE commands follow the SCORE command, while the SAVE option indicates that a SAVE command will follow directly after the FILES command. On the SAVE command, names for external files to which subject scores and combined scores will be saved are provided.

The first subtest consists of six items analyzed in six distinct blocks. The REPEAT keyword of the first block indicates that the first three blocks each contain one 3-category item with item-specific step parameters. The remaining blocks contain multiple-choice items with various

guessing parameters. The GPARM keyword is used here to correct the dichotomous item response probabilities in the presence of the GUESSING keyword. These guessing parameters are used for the initial parameter values and have a default value of zero. The value of (2,ESTIMATE) assigned to the GUESSING keywords indicates that the second category is the correct response and that a guessing parameter is to be estimated.

In the second subtest, the first 3 items are analyzed separately. In the third subtest, the last 3 items are analyzed separately. The convergence criterion for the iteration procedure is somewhat relaxed for this test calibration (0.005 ==> 0.01) to obtain convergence.

Scores for the three subtests are combined in the scoring phase. These scores are saved to the external file **exampl06.sco** as specified on the SAVE command. They are combined as specified by the COMBINE keyword in the INPUT command and the COMBINE commands following the last SCORE command. The WEIGHT keywords on these commands have as values sets of positive fractions summing to 1. These values are used as the weights for the subscale scores. Subscores are combined linearly. In this example, three different combinations of the scores from the subtests are requested. These scores are saved to the external file **exampl06.cmb**.

The command file **exampl06.psl** is shown below.

```
EXAMPLE 6: PARTIAL CREDIT MODEL
          ARTIFICAL DATA, ONE SAMPLE (N=1000, N=(0,1)), 6 ITEMS
>FILES  DFNAME='EXAMPL06.DAT', SAVE;
>SAVE   SCORE='EXAMPL06.EAP', COMBINE='EXAMPL06.CMB';
>INPUT  NIDCHAR=4, NTOT=6, NTEST=3, LENGTH=(6,3,3), COMBINE=3;
(4A1,1X,6A1)
>TEST1  TNAME=TEST1, ITEM=(1,2,3,4,5,6),
          INAME=('P011','P012','P013','D011','D012','D013'), NBLOCK=6;
>BLOCK1  REPEAT=3, NIT=1, NCAT=3, ORIGINAL=(1,2,3);
>BLOCK4  NIT=1, NCAT=2, ORIGINAL=(1,2), GPARM=0.0, GUESS=(2,ESTIMATE);
>BLOCK5  NIT=1, NCAT=2, ORIGINAL=(1,2), GPARM=0.1, GUESS=(2,ESTIMATE);
>BLOCK6  NIT=1, NCAT=2, ORIGINAL=(1,2), GPARM=0.3, GUESS=(2,ESTIMATE);
>CALIB   LOGISTIC, PARTIAL, NQPT=21, CYCLES=(100,1,1,1,1,1), NEWTON=2,
          CRIT=0.005, SCALE=1.7;
>SCORE    EAP, NAME=TEST1;
>TEST2  TNAME=TEST2, ITEM=(1,2,3), INAME=('P021','P022','P023'), NBLOCK=3;
>BLOCK1  REPEAT=3, NIT=1, NCAT=3, ORIGINAL=(1,2,3);
>CALIB   LOGISTIC, PARTIAL, NQPT=21, CYCLES=(100,1,1,1,1,1), NEWTON=2,
          CRIT=0.005, SCALE=1.7;
>SCORE    EAP,NAME=TEST2;
>TEST3  TNAME=TEST3, ITEM=(4,5,6), INAME=('D031','D032','D033'), NBLOCK=3;
>BLOCK4  NIT=1, NCAT=2, ORIGINAL=(1,2), GPARM=0.0, GUESS=(2,ESTIMATE);
>BLOCK5  NIT=1, NCAT=2, ORIGINAL=(1,2), GPARM=0.1, GUESS=(2,ESTIMATE);
>BLOCK6  NIT=1, NCAT=2, ORIGINAL=(1,2), GPARM=0.3, GUESS=(2,ESTIMATE);
>CALIB   LOGISTIC, PARTIAL, NQPT=21, CYCLES=(100,1,1,1,1,1), NEWTON=2,
          CRIT=0.01, SCALE=1.7;
>SCORE    EAP, NAME=TEST3;
>COMBINE1 NAME=SUM1, WEIGHT=(0.5,0.25,0.25);
>COMBINE2 NAME=SUM2, WEIGHT=(1.0,0.0,0.0);
>COMBINE3 NAME=SUM3, WEIGHT=(0.0,0.5,0.5);
```