

The use of the Mplus parameterization in IRT modeling is exemplified in the Cai et al. (2011) Psych Methods article on item bi-factor analysis. Page 224 talks about the binary item case and page 225 the graded case. The article refers to the Mplus parameterization as “slope-intercept” where the intercept is the negative threshold in Mplus. The article refers to the  $a(\theta - b)$  IRT parameterization as the “slope-threshold” parameterization where the “threshold” is the  $b$  difficulty parameter, not what Mplus calls threshold. The authors find that the slope-intercept parameterization (used by Mplus) is more general, saying on page 224:

In the unidimensional case, the logit in Equation 4 can be reexpressed in a more convenient slope-threshold form as  $d_{\theta} = a_{\theta}(\theta - b)$ , where  $b = -d_{\theta}/a_{\theta}$  is the threshold (or item difficulty) parameter, indicating the point on the  $\theta$  scale at which the probability for correct endorsement response is exactly .5 if  $c = 0$ , or .5  $\pm .5c$  if  $c$  is not 0. Unfortunately, the slope-threshold form does not generalize well to truly multidimensional models, so we adopt the slope-intercept parameterization for this model and all remaining IRT models.

The slope-intercept parameterization is also used in the Reckase (2009) book “Multidimensional IRT”; see section 4.1.1.1.