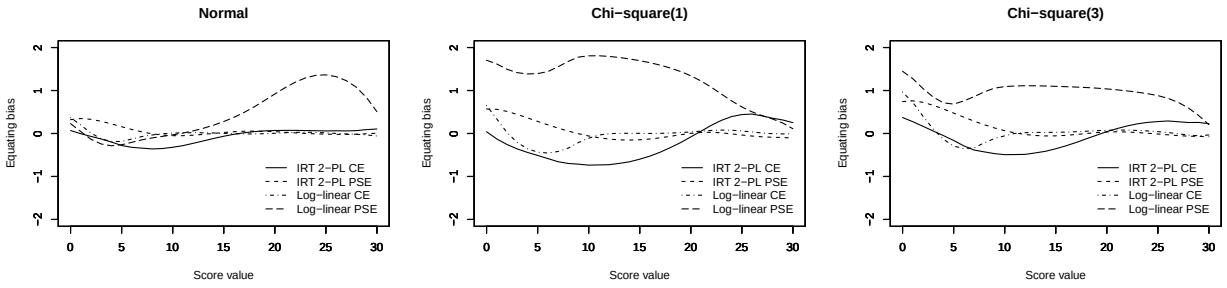
Supplement to Item Response Theory Observed-Score Kernel Equating

Abstract

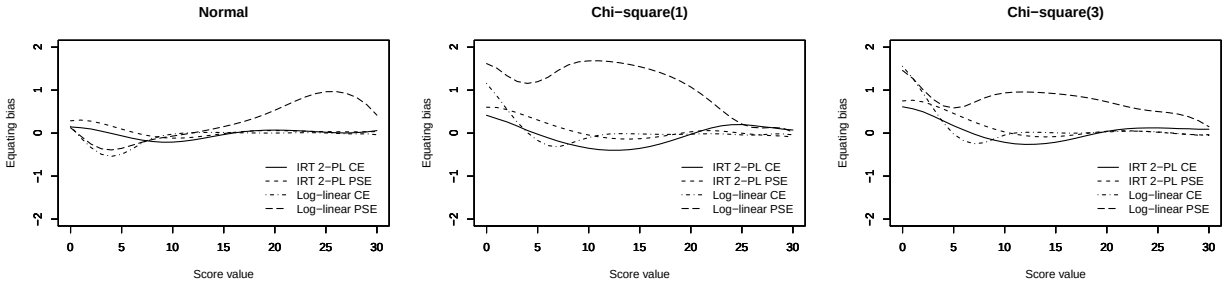
Item response theory (IRT) observed-score kernel equating is introduced for the non-equivalent groups with anchor test equating design using either chain equating or post-stratification equating. The equating function is treated in a multivariate setting and the asymptotic covariance matrices of IRT observed-score kernel equating functions are derived. Equating is conducted using the two-parameter and three-parameter logistic models with simulated data and data from a standardized achievement test. The results show that IRT observed-score kernel equating offers small standard errors and low equating bias under most settings considered.

Keywords: observed-score equating, item response theory, equipercentile equating, standard errors, NEAT design

Supplement to Item Response Theory Observed-Score Kernel Equating

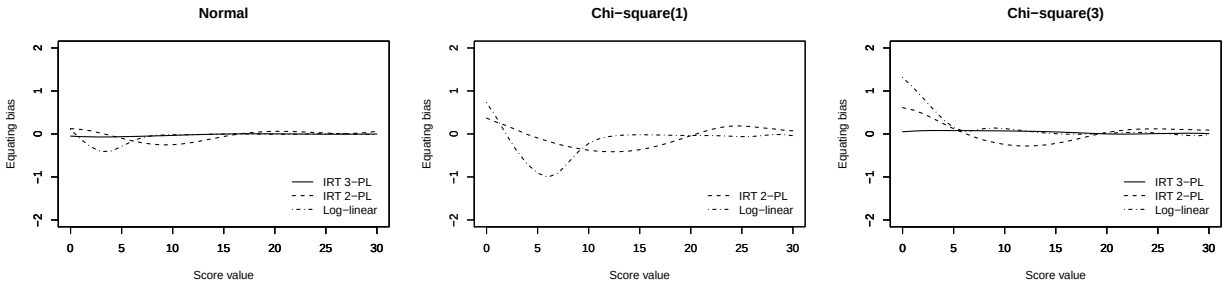


(a) Short anchor test.

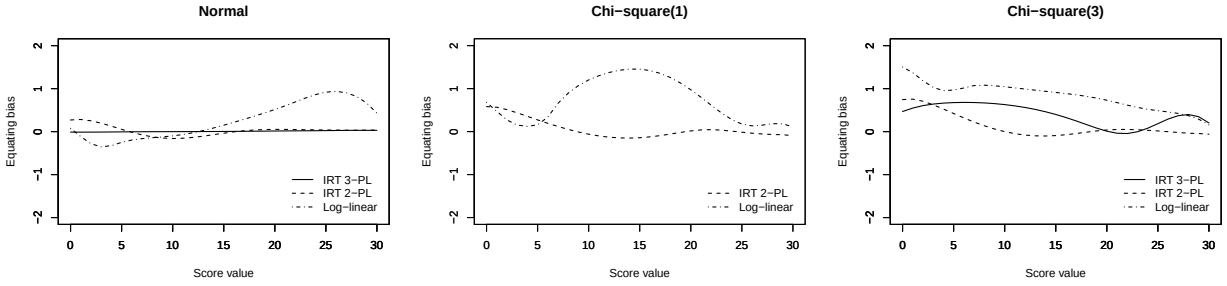


(b) Long anchor test.

Figure 1. Mean biases of the 2-PL and log-linear equating functions, n=1000

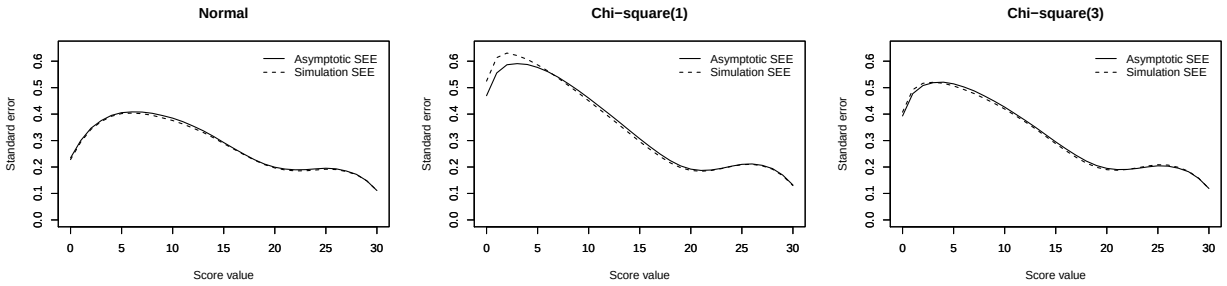


(a) CE

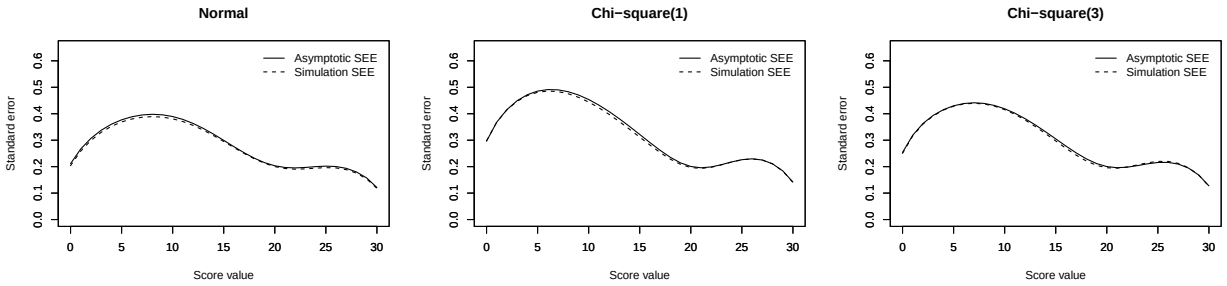


(b) PSE

Figure 2. Mean biases of the 2-PL, 3-PL and log-linear equating functions with the long anchor test, n=3000.

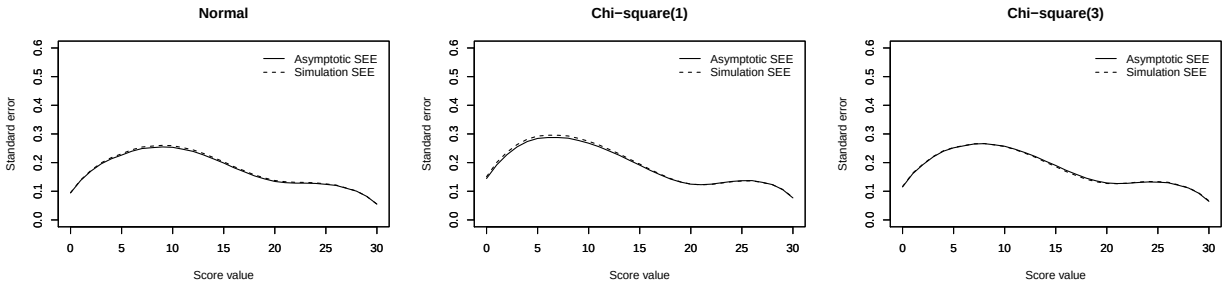


(a) CE

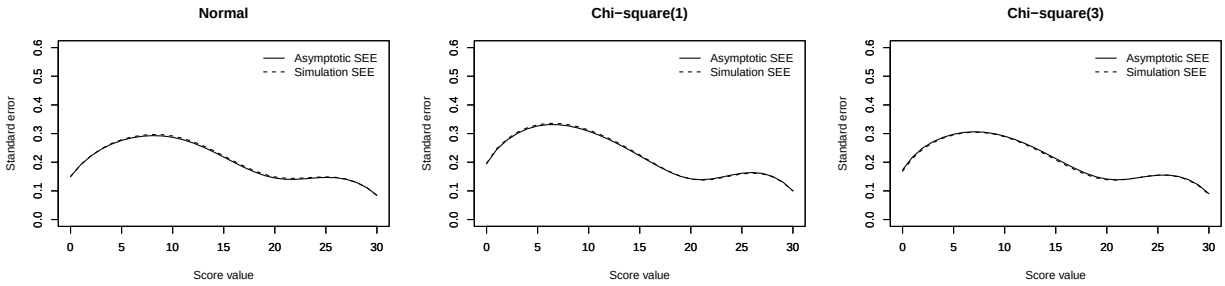


(b) PSE

Figure 3. Asymptotic and simulation SEEs for the 2-PL equating functions with the long anchor test, n=1000.

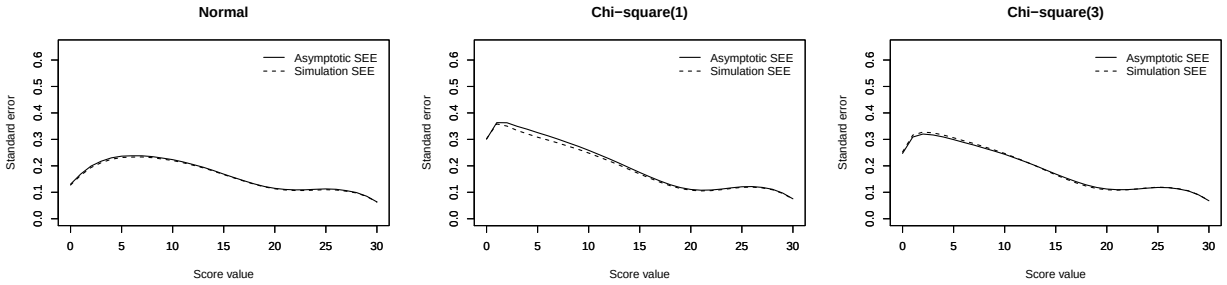


(a) CE

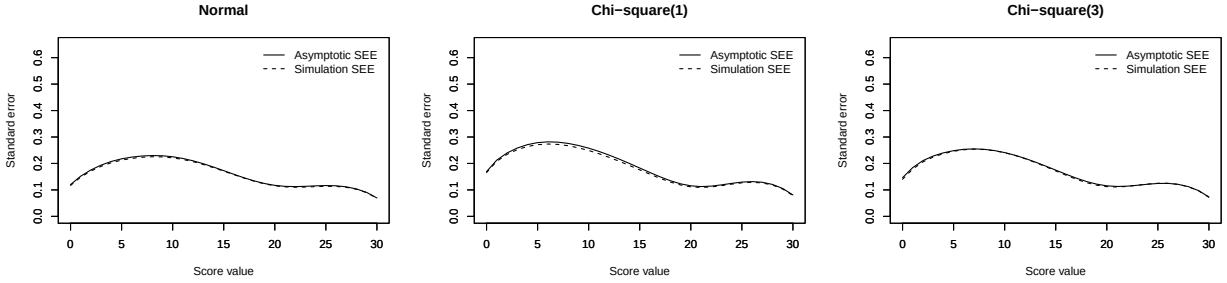


(b) PSE

Figure 4. Asymptotic and simulation SEEs for the 2-PL equating functions with the short anchor test, n=3000.

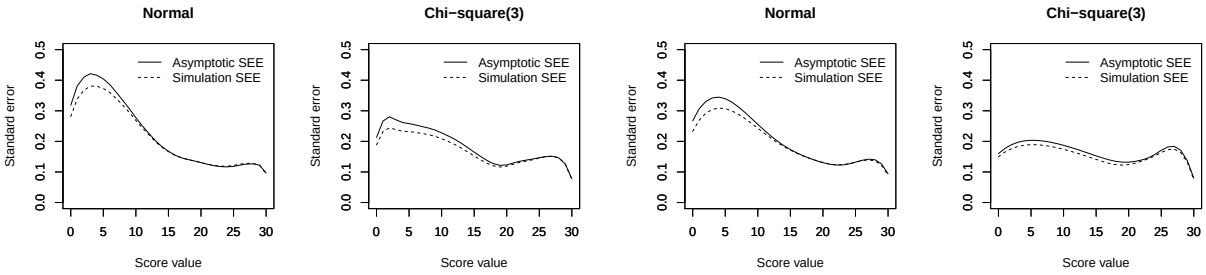


(a) CE



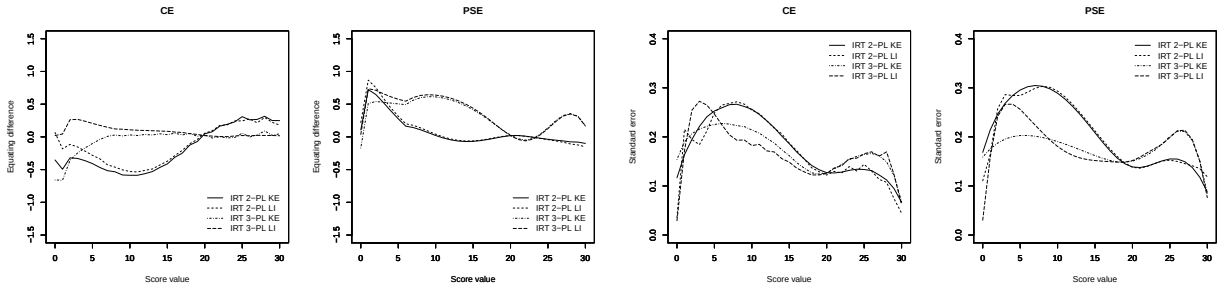
(b) PSE

Figure 5. Asymptotic and simulation SEEs for the 2-PL equating functions with the long anchor test, n=3000.



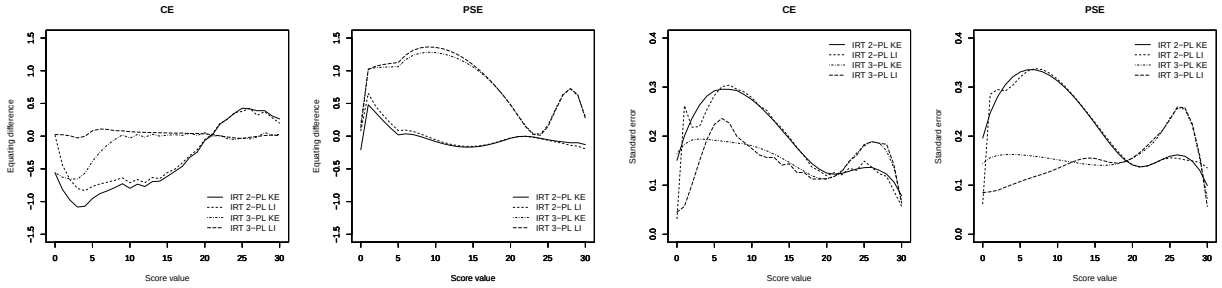
(a) CE (b) PSE

Figure 6. Asymptotic and simulation SEEs for the 3-PL equating functions with the long anchor test, n=3000.



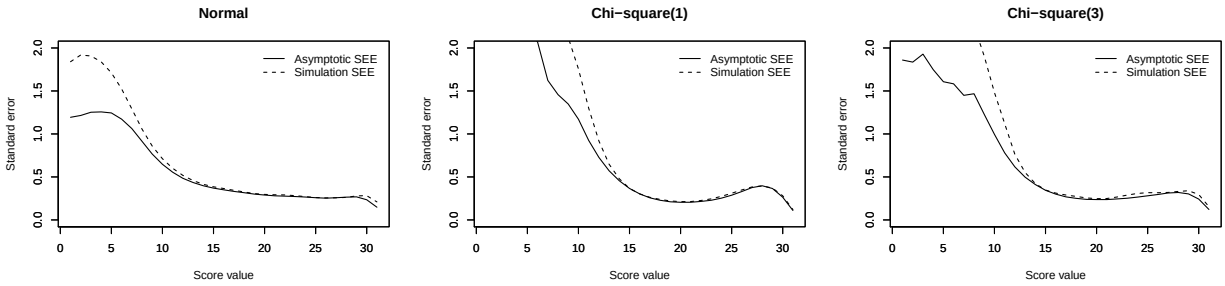
(a) Equating difference (b) Simulation SEE

Figure 7. Equating difference and simulation SEEs for the kernel and linear interpolation equating functions with standardized $\chi^2(3)$ distributions, n=3000.

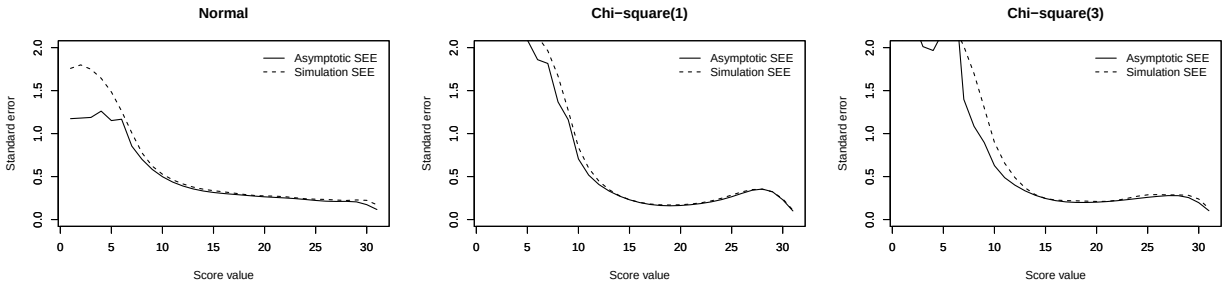


(a) Equating difference (b) Simulation SEE

Figure 8. Equating difference and simulation SEEs for the kernel and linear interpolation equating functions with standardized $\chi^2(1)$ distributions, n=3000.

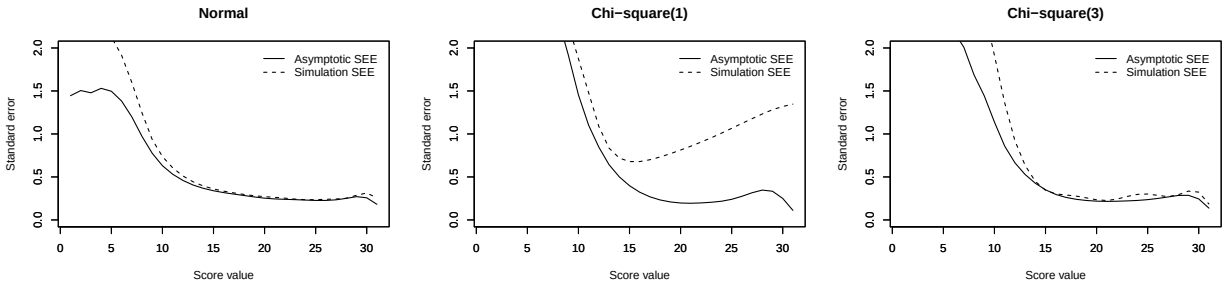


(a) CE

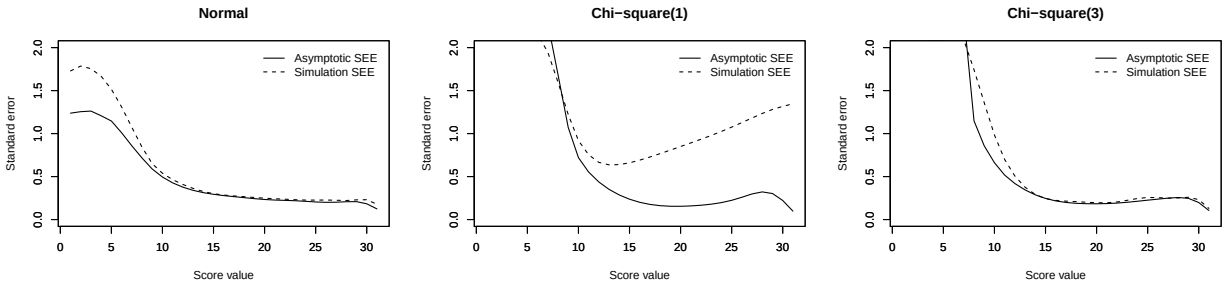


(b) PSE

Figure 9. Asymptotic and simulation SEEs for the log-linear equating functions with the short anchor test, n=1000.

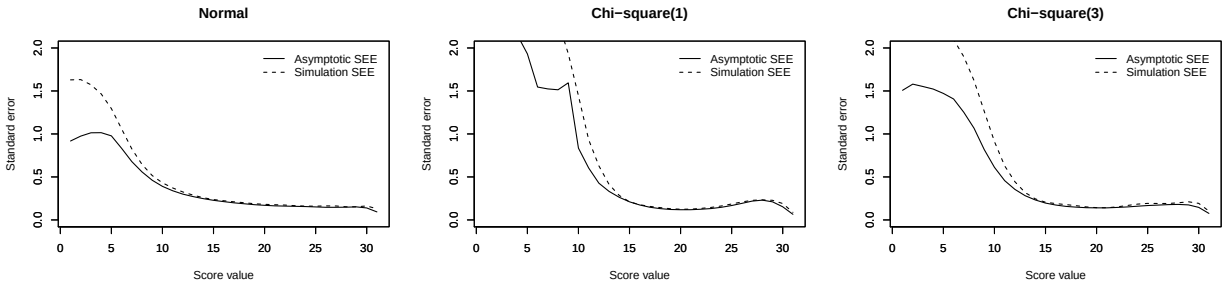


(a) CE

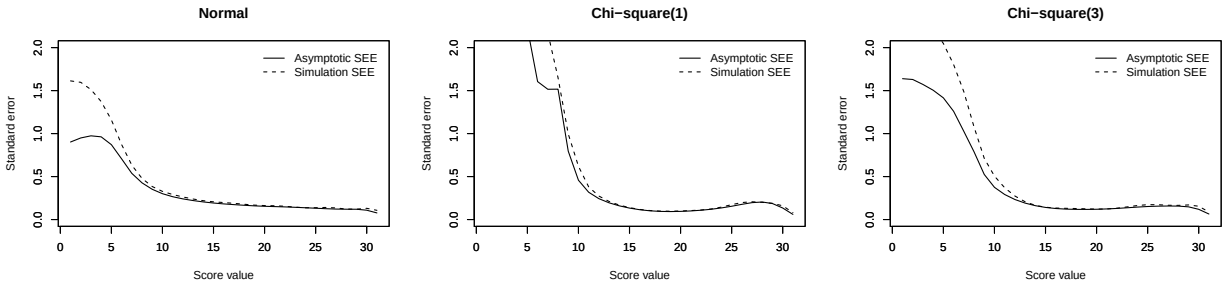


(b) PSE

Figure 10. Asymptotic and simulation SEEs for the log-linear equating functions with the long anchor test, n=1000.

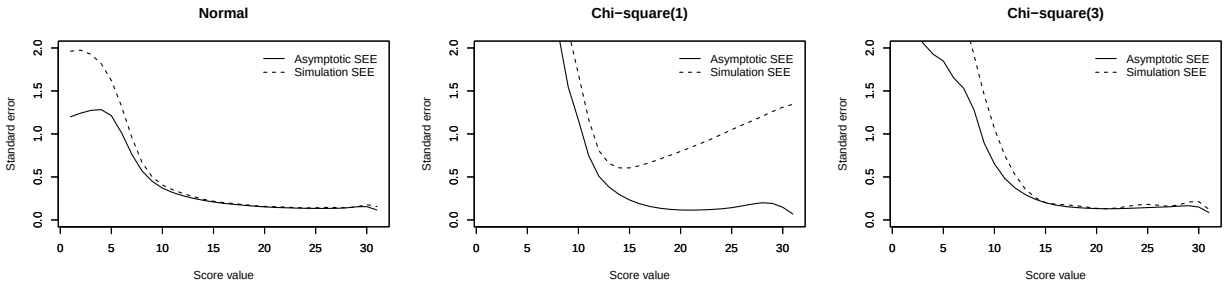


(a) CE

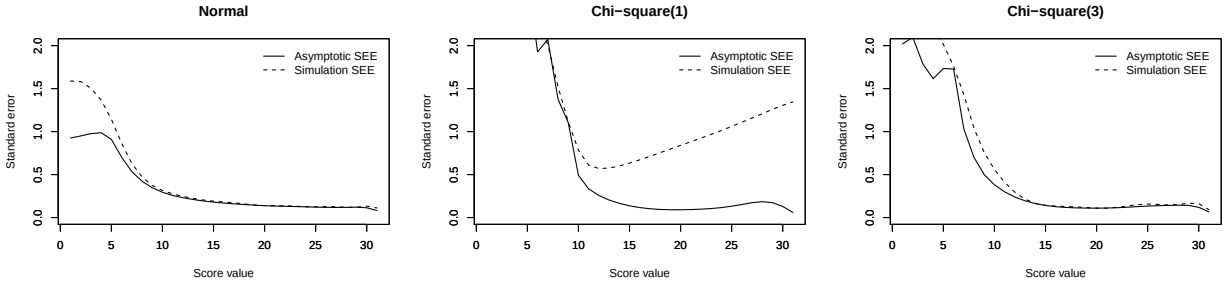


(b) PSE

Figure 11. Asymptotic and simulation SEEs for the log-linear equating functions with the short anchor test, n=3000.

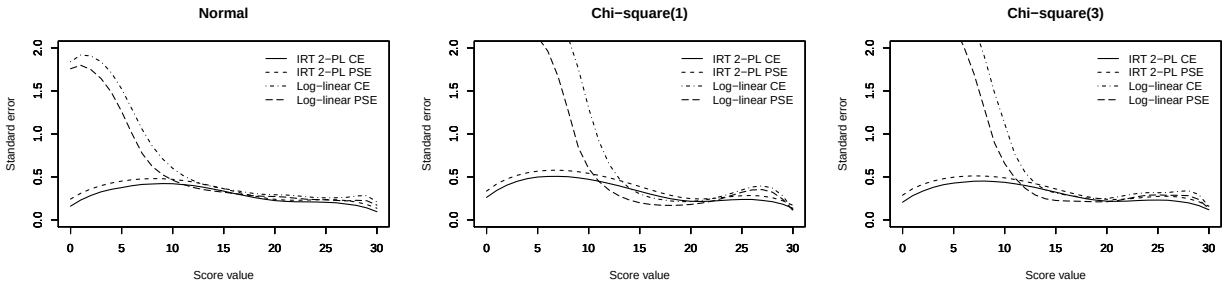


(a) CE

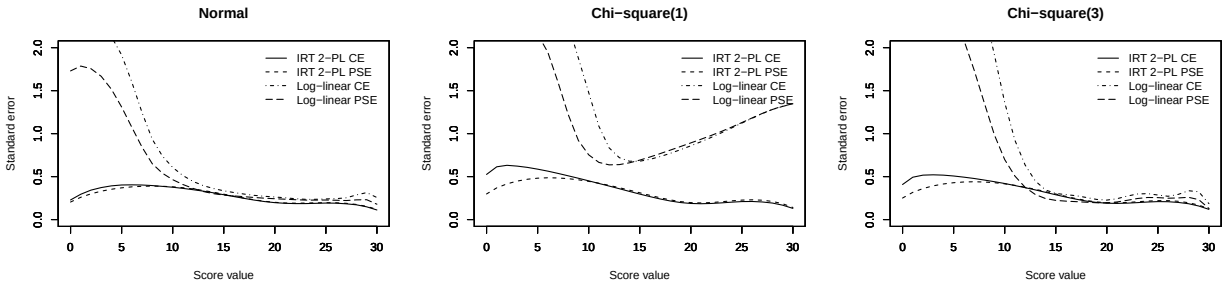


(b) PSE

Figure 12. Asymptotic and simulation SEEs for the log-linear equating functions with the long anchor test, n=3000.

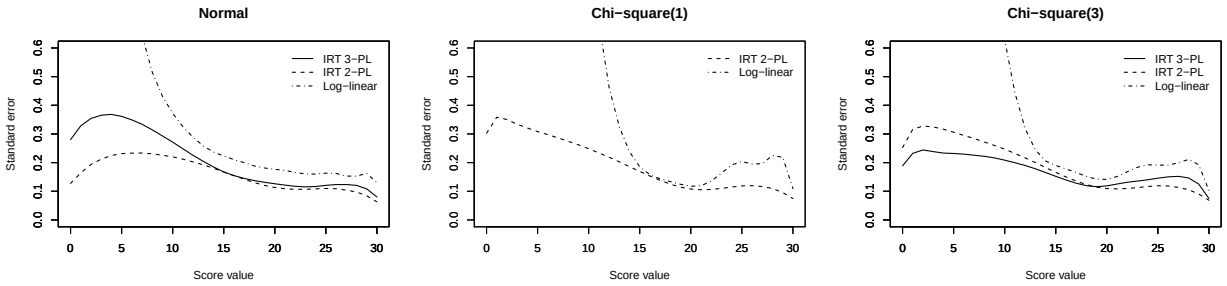


(a) Short anchor test.

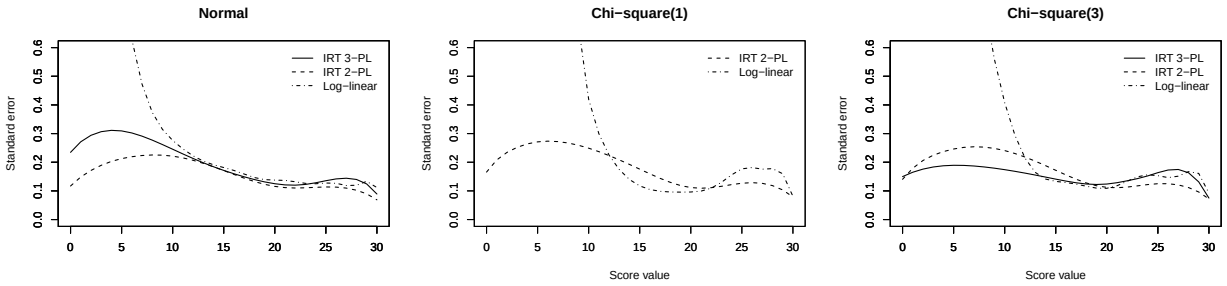


(b) Long anchor test.

Figure 13. Monte-Carlo simulation SEEs for the 2-PL and log-linear equating functions, n=1000.



(a) CE



(b) PSE

Figure 14. Monte-Carlo simulation SEEs for the 2-PL, 3-PL and log-linear equating functions with the long anchor test, n=3000.