

Supplementary Material

A multi-process item response model for not-reached items due to time limits and quitting

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Coverage

Table 1.1. Coverage of item parameter means, variances, and covariances

K	N	% NR	Mechanisms	$var(b)$	$var(\beta)$	$cov(b, \beta)$	μ_b	μ_β
20	350	2.5%	quitting	.89	1.00	.99	.96	.98
			speed & quitting	.89	.98	.94	.89	.96
		5%	quitting	.95	.97	.92	.94	.98
			speed & quitting	.95	.94	.96	.93	.96
		10%	quitting	.96	.99	.98	1.00	.97
			speed & quitting	.95	1.00	.98	.93	.97
	700	2.5%	quitting	.96	1.00	.99	.90	.97
			speed & quitting	.95	.98	.95	.96	.95
		5%	quitting	.93	.98	.99	.90	.94
			speed & quitting	.90	.98	.96	.97	.97
		10%	quitting	.86	.97	.92	.98	.96
			speed & quitting	.96	.98	.95	.96	.97
	350	2.5%	quitting	.94	.96	.93	.99	.97
			speed & quitting	.92	.97	.95	.96	.92
		5%	quitting	.95	.98	.95	.96	.97
			speed & quitting	.91	.97	1.00	.94	.95
		10%	quitting	.90	.96	1.00	.82	.97
			speed & quitting	.96	.95	.90	.95	.92
	40	2.5%	quitting	.93	.94	.93	.93	.95
			speed & quitting	.95	.97	.95	.94	.98
		5%	quitting	.94	.95	.97	.99	.98
			speed & quitting	.94	.96	.96	.97	.97
		10%	quitting	.96	.99	.98	.97	.99
			speed & quitting	.98	.94	.94	.99	.98

Note: % NR: overall missingness rate; quitting and speed & quitting denote conditions under which all not-reached items go back to quitting and not-reached items occurred to both lack of speed and quitting, respectively; K : number of items; N : number of examinees; b : item difficulty; β : time intensity; μ_b : mean item difficulty; μ_β : mean time intensity.

Table 1.2. Coverage of person parameter means, variances, and covariances

K	N	% NR	Mechanisms	$var(\theta)$	$var(\tau)$	$var(\zeta)$	$cov(\theta, \tau)$	$cov(\theta, \zeta)$	$cov(\theta, \zeta)$	μ_{ζ}
350		2.5%	quitting	1.00	1.00	.98	1.00	.97	.96	.98
			speed & quitting	.99	1.00	.87	1.00	.97	.98	.93
		5%	quitting	.96	1.00	1.00	1.00	.99	.97	.95
			speed & quitting	.99	1.00	.97	1.00	.98	1.00	.98
		10%	quitting	1.00	1.00	.84	1.00	.97	1.00	.79
			speed & quitting	1.00	1.00	.96	1.00	1.00	.97	.98
20		2.5%	quitting	.99	1.00	.97	1.00	.95	.94	.96
			speed & quitting	1.00	1.00	.88	1.00	.95	.97	.96
		5%	quitting	.98	1.00	.96	1.00	.93	.97	.92
			speed & quitting	.99	1.00	1.00	1.00	.97	.94	1.00
		10%	quitting	1.00	1.00	.92	1.00	1.00	.95	.76
			speed & quitting	.98	.96	.97	.99	1.00	.98	.91
350		2.5%	quitting	1.00	1.00	.91	1.00	.97	.96	.98
			speed & quitting	1.00	1.00	.80	1.00	.95	.91	.83
		5%	quitting	1.00	1.00	.97	1.00	1.00	.99	.98
			speed & quitting	1.00	1.00	.87	1.00	.93	.92	.91
		10%	quitting	1.00	1.00	.99	1.00	.96	1.00	.99
			speed & quitting	.99	1.00	.96	1.00	.99	1.00	.97
40		2.5%	quitting	1.00	1.00	.95	1.00	.98	.99	.97
			speed & quitting	1.00	1.00	.67	1.00	.91	.90	.75
		5%	quitting	1.00	1.00	.97	1.00	.99	.99	.96
			speed & quitting	1.00	1.00	.86	1.00	.99	.98	.85
		10%	quitting	1.00	1.00	.98	1.00	.99	1.00	.93
			speed & quitting	1.00	1.00	.99	1.00	.96	.97	.99

Note: % NR: overall missingness rate; quitting and speed & quitting denote conditions under which all not-reached items go back to quitting and not-reached items occurred due to both lack of speed and quitting, respectively; K : number of items; N : number of examinees; θ : ability; τ : speed; ζ : test endurance; μ_{ζ} : mean test endurance.

Parameter Recovery

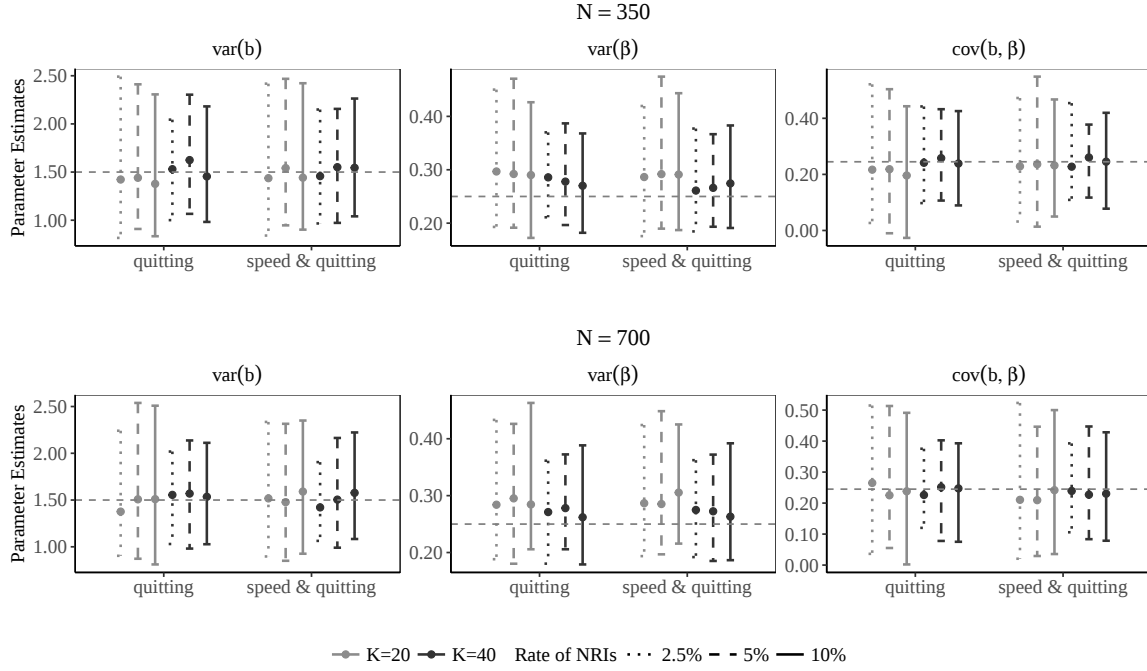


Figure 1.1. Medians and 90% ranges of item parameter variance and covariance estimates over all 100 replications per condition. The dashed horizontal line indicates the respective true parameter. Note that y-axes differ in scale. b : item difficulty; β : time intensity; N : number of examinees; K : number of items; NRIs: not-reached items; quitting and speed & quitting denote conditions under which all not-reached items go back to quitting and not-reached items occurred due to both lack of speed and quitting, respectively.

A MULTI-PROCESS ITEM RESPONSE MODEL FOR NOT-REACHED ITEMS DUE TO TIME LIMITS AND QUITTING

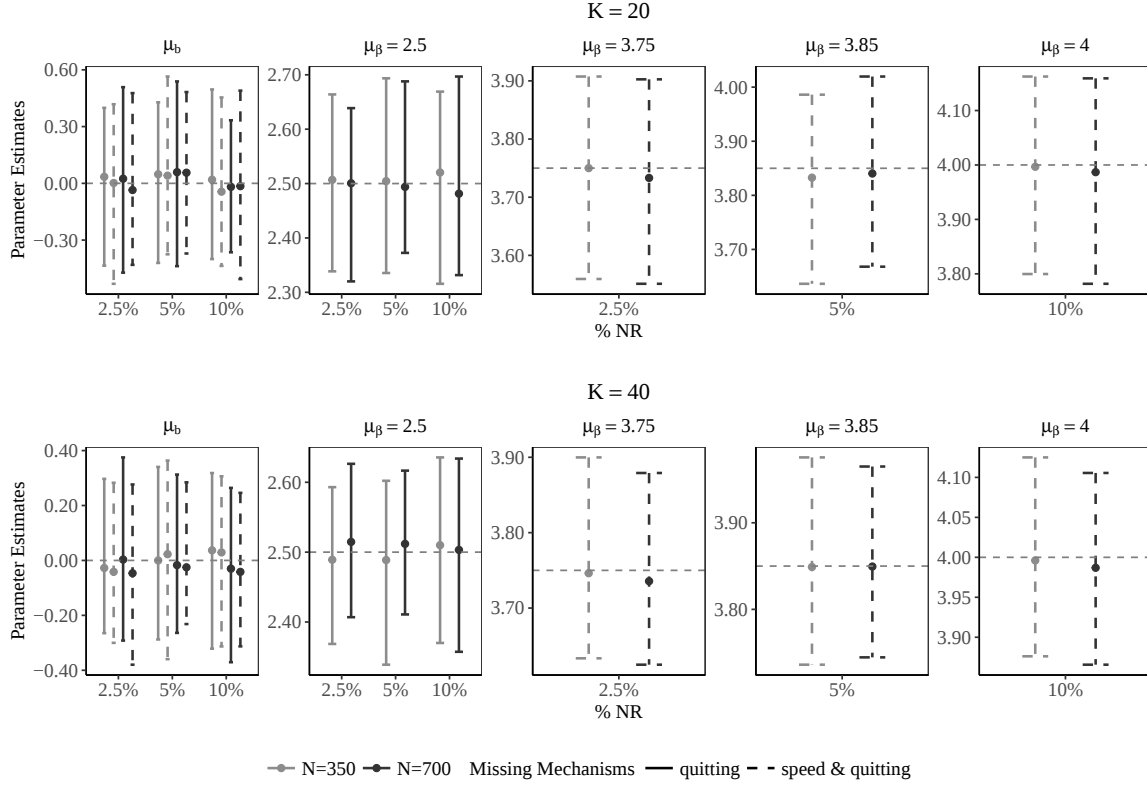


Figure 1.2. Medians and 90% ranges of item parameter means over all 100 replications per condition. The dashed horizontal line indicates the respective true parameter. Plots are organized according to the data-generating values employed to achieve missingness rates due to lack of speed ranging from 0% (missingness due to quitting) to 5% (speed & quitting, 10%). Note that y-axes differ in scale. μ_b : mean item difficulty; μ_β : mean time intensity; N : number of examinees; K : number of items; % NR: overall missingness rate due to not-reached items; quitting and speed & quitting denote conditions under which all not-reached items go back to quitting and not-reached items occurred due to both lack of speed and quitting, respectively.