Treatment Outcome Generative Process

$$D_{ ext{Sid,t}}^* \sim ext{Normal}(D_{ ext{Sid,t}}, \sigma) \ D_{ ext{Sid,t}} = lpha + (lpha_{ ext{Sid}} + \gamma_{ ext{TD[Sid]}} \mathbf{t}) + eta_{ ext{TD[T[Sid]]}} \mathbf{t} \ + eta_{ ext{AD}} A_{ ext{Sid}} + eta_{ ext{ED}} E_{ ext{Sid,t}} \ \sigma \sim ext{Exponential}(1) \ egin{bmatrix} lpha \\ \gamma \end{bmatrix} \sim ext{MVNormal}(\mathbf{0}, \mathbf{\Sigma}) \ & lpha \sim ext{Normal}(0, 1.5) \ eta_{ ext{TD}}, eta_{ ext{AD}}, eta_{ ext{ED}} \sim ext{Normal}(0, 1) \ \end{pmatrix}$$

(1)

Item Response Generative Process

$$R_{
m Sid, Iid, t} \sim {
m Ordered Logit}(\phi_{
m Sid, Iid, t}, \kappa)$$

$$\phi_{
m Sid, Iid, t} = E_{
m Sid, t} + I_{
m Iid}$$

$$\kappa \sim {
m Normal}(0, 1)$$

$$E \sim {
m Normal}(0, 2)$$

$$I \sim {
m Normal}(0, \rho)$$

$$\rho \sim {
m Exponential}(1.5)$$

$$(2)$$

Efficacy Generative Process

$$\begin{split} E_{\rm Sid,t} &\sim {\rm Normal}(\mu_{\rm Sid,t},\tau) \\ \mu_{\rm Sid,t} &= \delta + \beta_{\rm AE} A_{\rm Sid} + \beta_{\rm TE[T_{\rm Sid}]} \mathsf{t} \\ \tau &\sim {\rm Exponential}(1) \\ \delta &\sim {\rm Normal}(0,1) \\ \beta_{\rm AE}, \beta_{\rm TE} &\sim {\rm Normal}(0,1) \end{split} \tag{3}$$