Treatment Outcome Generative Process

$$
\begin{aligned}
D^{*}_{\text{Sid,t}} &\sim \text{Normal}(D_{\text{Sid,t}}, \sigma) \\
D_{\text{Sid,t}} &= \alpha + (\alpha_{\text{Sid}} + \gamma_{\text{TD[Sid]}}\text{t}) + \beta_{\text{TD[T}_{\text{Sid}}]}\text{t} \\
&\quad + \beta_{\text{AD}}\text{A}_{\text{Sid}} + \beta_{\text{ED}}E_{\text{Sid,t}} \\
\sigma &\sim \text{Exponential}(1) \\
\begin{bmatrix}\alpha \\ \gamma\end{bmatrix} &\sim \text{MVNormal}(\mathbf{0}, \mathbf{\Sigma}) \\
\alpha &\sim \text{Normal}(0, 1.5) \\
\beta_{\text{TD}}, \beta_{\text{AD}}, \beta_{\text{ED}} &\sim \text{Normal}(0, 1)
\end{aligned}
\tag{1}
$$

Item Response Generative Process

$$
\begin{aligned}
R_{\text{Sid,Iid,t}} &\sim \text{OrderedLogit}(\phi_{\text{Sid,Iid,t}}, \kappa) \\
\phi_{\text{Sid,Iid,t}} &= E_{\text{Sid,t}} + I_{\text{Iid}} \\
\kappa &\sim \text{Normal}(0, 1) \\
E &\sim \text{Normal}(0, 2) \\
I &\sim \text{Normal}(0, \rho) \\
\rho &\sim \text{Exponential}(1.5)
\end{aligned}
\tag{2}
$$

Efficacy Generative Process

$$
\begin{aligned}
E_{\text{Sid,t}} &\sim \text{Normal}(\mu_{\text{Sid,t}}, \tau) \\
\mu_{\text{Sid,t}} &= \delta + (\delta_{\text{Sid}} + \gamma_{\text{TE[Sid]}}\text{t}) \\
&\quad + \beta_{\text{AE}}\text{A}_{\text{Sid}} + \beta_{\text{TE[T}_{\text{Sid}}]}\text{t} \\
\tau &\sim \text{Exponential}(1) \\
\delta &\sim \text{Normal}(0, 1) \\
\beta_{\text{AE}}, \beta_{\text{TE}} &\sim \text{Normal}(0, 1)
\end{aligned}
\tag{3}
$$