

# Write Risom

$$Y_{ij} \sim \text{Normal}(\mu_{ij})$$

$$\bar{\theta}_t^i(\tau_{ij}) = \bar{\theta}_{it}(x_i) = \sum_{t=1}^T \theta_{it}^i \mathbb{I}(x_i < t, \theta)$$

$$\sum_{j=1}^J Y_{ij} \mid T_j, M^{(t)} \sim N(\mu_i(x_i), 1)$$

$$\eta_{ij} = \mathbb{I}(Z_{ij} > 0) \rightarrow p(y_{ij} | Z_{ij}) = \mathbb{I}(Z_{ij} > 0)^{\eta_{ij}} \mathbb{I}(Z_{ij} < 0)^{1-\eta_{ij}}$$

Update  $T_t$

$$\sqrt{\frac{1}{N(T_t)}} = f(T_t) \prod_{i \in K_t} \left[ \prod_{j=1}^J N(Z_{ij} \mid \theta_{ij}, \tau_{ij}) \right] N(\theta_{ij} \mid 0, \sigma_\theta^2) d\theta_{ij}^{(t)}$$

$$f_\theta(t, L) = \int_{\substack{i \in K_t \\ j \in J \\ i < t \\ j < L}} f_{\theta}(\{Z_{ij}\} \mid T_t) f(\{\theta_{ij}\} \mid T_t)$$

model specific cop

Update  $\left\{ \sum_{j=1}^J N(Z_{ij} \mid \theta_{ij}, \sigma_\theta^2) \right\}_{i=1}^N$

$$f(Z_{ij}) \propto f(Z_{ij} \mid T_t, M^{(t)}) f(y_{ij} \mid Z_{ij})$$

$$\rightarrow Z_{ij} \sim TN(\mu_i(x_i), 1, L, U)$$

$$\begin{aligned} y_{ij} = 0 &\rightarrow (L = -\infty, U = 0) \\ y_{ij} = 1 &\rightarrow (L = 0, U = \infty) \end{aligned}$$

Update  $\bar{\theta}_{it}^{(t)}$   $t = 1, \dots, T$ ,  $i \in I$ ,  $j = 1, 2$

$$\begin{aligned} f(t_{ij}^{(t)} \mid \cdot) &\propto f(\theta_{it}^{(t)} \mid \cdot) f(\{Z_{ij}\} \mid T_j, M^{(t)}) = N(\theta_{it}^{(t)} \mid 0, \tilde{\sigma}_\theta^2) \prod_{\substack{i \in K_t \\ j \in J \\ i < t \\ j < t_{ij}^{(t)}}} N(Z_{ij} \mid \theta_{it}^{(t)}) \\ &\propto \exp \left\{ -\frac{1}{2} \left[ \theta_{it}^{(t)} \left( \frac{1}{\tilde{\sigma}_\theta^2} + \lambda \right) - 2 \sum_{l=t+1}^{t_{ij}^{(t)}} Z_{il} \right]^2 \right\} \\ &\rightarrow \bar{\theta}_{it}^{(t)} \sim N \left( \left( \frac{1}{\tilde{\sigma}_\theta^2} + \lambda \right)^{-1} \sum_{l=t+1}^{t_{ij}^{(t)}} Z_{il} \right)^{-1} \quad \text{where } \lambda = \left| \{i : T_i > t_{ij}^{(t)}\} \right| \end{aligned}$$

