

# CWVS: Critical Window Variable Selection

## Statistical Model

$$y_i | \beta, \alpha \stackrel{\text{ind}}{\sim} \text{Bernoulli} \{p_i(\beta, \alpha)\}, \quad i = 1, \dots, n;$$

$$\log \left\{ \frac{p_i(\beta, \alpha)}{1 - p_i(\beta, \alpha)} \right\} = \mathbf{x}_i^T \beta + \sum_{j=1}^{m_i} z_{ij} \alpha(j);$$

$$\alpha(j) = \theta(j) \gamma(j), \quad j = 1, \dots, m;$$

$$\gamma(j) | \pi(j) \stackrel{\text{ind}}{\sim} \text{Bernoulli} \{\pi(j)\}, \quad \Phi^{-1} \{\pi(j)\} = \eta(j), \quad j = 1, \dots, m;$$

$$\begin{bmatrix} \theta(t) \\ \eta(t) \end{bmatrix} = A \begin{bmatrix} \delta_1(t) \\ \delta_2(t) \end{bmatrix}, \quad A = \begin{bmatrix} A_{11} & 0 \\ A_{21} & A_{22} \end{bmatrix};$$

$$\boldsymbol{\delta}_j = \{\delta_j(1), \dots, \delta_j(m)\}^T | \phi_j \stackrel{\text{ind}}{\sim} \text{MVN} \{\mathbf{0}_m, \Sigma(\phi_j)\}, \quad j = 1, 2;$$

- $m = \max \{m_i : i = 1, \dots, n\};$
- $\mathbf{0}_m$ : Length  $m$  vector with each entry equal to zero.

## Prior Information

$$\beta_j \stackrel{\text{iid}}{\sim} \text{N}(0, \sigma_\beta^2), \quad j = 1, \dots, p;$$

- $p$ : Length of  $\mathbf{x}_{ij}$  vector (same for all  $i, j$ );
- Default setting:  $\sigma_\beta^2 = 10,000$ .

$$\ln(A_{11}), \ln(A_{22}), A_{21} \stackrel{\text{iid}}{\sim} \text{N}(0, \sigma_A^2)$$

- Default setting:  $\sigma_A^2 = 1$ .

$$\phi_j \stackrel{\text{iid}}{\sim} \text{Gamma}(\alpha_{\phi_j}, \beta_{\phi_j}), \quad j = 1, 2;$$

- Default setting:  $\alpha_{\phi_j} = 1.00, \beta_{\phi_j} = 1.00, j = 1, 2$ .

## Default Initial Values

- $\beta_j = 0$  for all  $j$ ;
- $\gamma(j) = 1$  for all  $j$ ;
- $\delta_{jk} = 0$  for all  $j, k$ ;
- $\sigma_\theta^2 = 1.00$ ;
- $\sigma_\eta^2 = 1.00$ ;
- $\phi_j = -\ln(0.05) / (m - 1)$  for all  $j$ ;
- $A_{jj} = 1$  for all  $j$ ;
- $A_{21} = 0$ .