CWVS: Critical Window Variable Selection

Statistical Model

$$Y_i | \boldsymbol{\beta}, \boldsymbol{\alpha} \overset{\text{ind}}{\sim} \text{Bernoulli} \left\{ p_i \left(\boldsymbol{\beta}, \boldsymbol{\alpha} \right) \right\}, \ i = 1, ..., n;$$

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

$$\alpha \left(j \right) = \theta \left(j \right) \gamma \left(j \right), \ j = 1, ..., m;$$

$$\gamma \left(j \right) | \pi \left(j \right) \overset{\text{ind}}{\sim} \text{Bernoulli} \left\{ \pi \left(j \right) \right\}, \ \Phi^{-1} \left\{ \pi \left(j \right) \right\} = \eta \left(j \right), \ j = 1, ..., m;$$

$$\left[\begin{array}{c} \theta \left(j \right) \\ \eta \left(j \right) \end{array} \right] = A \left[\begin{array}{c} \delta_1 \left(j \right) \\ \delta_2 \left(j \right) \end{array} \right], \ A = \left[\begin{array}{cc} A_{11} & 0 \\ A_{21} & A_{22} \end{array} \right];$$

$$\boldsymbol{\delta}_k = \left\{ \delta_k \left(1 \right), ..., \delta_k \left(m \right) \right\}^{\text{T}} | \phi_k \overset{\text{ind}}{\sim} \text{MVN} \left\{ \mathbf{0}_m, \Sigma \left(\phi_k \right) \right\}, \ k = 1, 2;$$

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

Prior Information

$\beta_j \overset{\text{iid}}{\sim} \text{N} \left(0, \sigma_\beta^2 \right), \ j = 1, ..., p;$

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

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

- Default setting: $\sigma_A^2 = 1.00.$

$\phi_k \overset{\text{iid}}{\sim} \text{Gamma} \left(\alpha_{\phi_k}, \beta_{\phi_k} \right), \ k = 1, 2;$

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

Default Initial Values

- $\beta_j = 0$ for all j;
- $\gamma \left(j \right) = 1$ for all j;
- $\delta_k \left(j \right) = 0$ for all j, k;
- $\sigma_\theta^2 = 1.00;$
- $\sigma_\eta^2 = 1.00;$
- $\phi_k = -\ln \left(0.05 \right) / \left(m - 1 \right)$ for all k;
- $A_{kk} = 1$ for all k;
- $A_{21} = 0.$