$$\hat{\Theta}_1^{(-1)} \tag{1}$$
$$\hat{\Theta}_2^{(-1)} \tag{2}$$
$$\hat{\Theta}_3^{(-1)} \tag{3}$$
$$\hat{\Theta}_4^{(-1)} \tag{4}$$
$$\tag{5}$$

$$\begin{pmatrix} \hat{\Theta}_1^{(-1)} & \hat{\Theta}_1^{(-2)} & \hat{\Theta}_1^{(-3)} & \hat{\Theta}_1^{(-4)} & \hat{\Theta}_1^{(-5)} \\ \hat{\Theta}_2^{(-1)} & \hat{\Theta}_2^{(-2)} & \hat{\Theta}_2^{(-3)} & \hat{\Theta}_2^{(-4)} & \hat{\Theta}_2^{(-5)} \\ \hat{\Theta}_3^{(-1)} & \hat{\Theta}_3^{(-2)} & \hat{\Theta}_3^{(-3)} & \hat{\Theta}_3^{(-4)} & \hat{\Theta}_3^{(-5)} \\ \hat{\Theta}_4^{(-1)} & \hat{\Theta}_4^{(-2)} & \hat{\Theta}_4^{(-3)} & \hat{\Theta}_4^{(-4)} & \hat{\Theta}_4^{(-5)} \end{pmatrix} \tag{6}$$
$$\Theta_{SL}^{(-1)} = \alpha_1 \hat{\Theta}_1^{(-1)} + \alpha_2 \hat{\Theta}_2^{(-1)} + \alpha_3 \hat{\Theta}_3^{(-1)} + \alpha_4 \hat{\Theta}_4^{(-1)} \tag{7}$$

$$\Theta_{SL}^{(-1)} \tag{8}$$
$$\Theta_{SL}^{(-2)} \tag{9}$$
$$\Theta_{SL}^{(-3)} \tag{10}$$
$$\Theta_{SL}^{(-4)} \tag{11}$$
$$\Theta_{SL}^{(-5)} \tag{12}$$
$$\tag{13}$$

$$Q_k(\boldsymbol{\alpha}) = \frac{n}{2} \log \left(|\alpha_1 \hat{\Theta}_1^{(-k)} + \cdots + \alpha_4 \hat{\Theta}_4^{(-k)}| \right) + \frac{1}{2} \sum_{i=1}^{n} (X_k^{(i)})^T \left(\alpha_1 \hat{\Theta}_1^{(-k)} + \cdots + \alpha_4 \hat{\Theta}_4^{(-k)} \right) X_k^{(i)} \tag{14}$$

$$\bar{Q}(\boldsymbol{\alpha}) = \frac{1}{5} \sum_{k=1}^{5} \left\{ \frac{n_k}{2} \log \left(|\alpha_1 \hat{\Theta}_1^{(-k)} + \cdots + \alpha_4 \hat{\Theta}_4^{(-k)}| \right) \right. \tag{15}$$
$$\left. + \frac{1}{2} \sum_{i=1}^{n_k} (X_k^{(i)})^T \left(\alpha_1 \hat{\Theta}_1^{(-k)} + \cdots + \alpha_4 \hat{\Theta}_4^{(-k)} \right) X_k^{(i)} \right\} \tag{16}$$

$$\hat{\boldsymbol{\alpha}} = \text{argmin}_{\boldsymbol{\alpha}} \left\{ \bar{Q}(\boldsymbol{\alpha}); \sum_{m=1}^{M} \alpha_m = 1; \alpha_m \geq 0 \right\} \tag{17}$$

$$X_{-1} : p \times (n - n_1) \tag{18}$$
$$X_1 : p \times n_1 \tag{19}$$