Some of the covariance structures available in SAS proc mixed. From SAS Institute Inc., *SAS/STAT software changes and enhancements through release 6.11*. Cary, NC, 1996.

| Type | Option | $ij^{th}$ element | Structure |
|---|---|---|---|
| No structure | no repeated statement or split plot | $\sigma^2$ for i=j,<br>0 otherwise | $\sigma^2 [I] = \begin{bmatrix} \sigma^2 & 0 & 0 & 0 \\ 0 & \sigma^2 & 0 & 0 \\ 0 & 0 & \sigma^2 & 0 \\ 0 & 0 & 0 & \sigma^2 \end{bmatrix}$ |
| Variance components | VC | $\sigma_i^2$ for i=j,<br>0 otherwise | $\begin{bmatrix} \sigma_1^2 & 0 & 0 & 0 \\ 0 & \sigma_2^2 & 0 & 0 \\ 0 & 0 & \sigma_3^2 & 0 \\ 0 & 0 & 0 & \sigma_4^2 \end{bmatrix}$ |
| Compound Symmetry | CS | $\sigma^2 + \sigma_1^2$ for i=j,<br>$\sigma_1^2$ otherwise<br>two levels of $\sigma^2$ | $\begin{bmatrix} \sigma^2+\sigma_1^2 & \sigma_1^2 & \sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma^2+\sigma_1^2 & \sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma_1^2 & \sigma^2+\sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma_1^2 & \sigma_1^2 & \sigma^2+\sigma_1^2 \end{bmatrix}$ |
| Unstructured | UN | $\sigma_i^2$ for i=j,<br>symmetric covariance<br>$\sigma_{ij} = \sigma_{ji}$ | $\begin{bmatrix} \sigma_{11}^2 & \sigma_{21} & \sigma_{31} & \sigma_{41} \\ \sigma_{21} & \sigma_{22}^2 & \sigma_{32} & \sigma_{42} \\ \sigma_{31} & \sigma_{32} & \sigma_{33}^2 & \sigma_{43} \\ \sigma_{41} & \sigma_{42} & \sigma_{43} & \sigma_{44}^2 \end{bmatrix}$ |
| First-Order Autoregressive | AR(1) | $\sigma^2$ for i=j,<br>$\sigma^2\rho^{\lvert i-j\rvert}$ otherwise | $\sigma^2 \begin{bmatrix} 1 & \rho & \rho^2 & \rho^3 \\ \rho & 1 & \rho & \rho^2 \\ \rho^2 & \rho & 1 & \rho \\ \rho^3 & \rho^2 & \rho & 1 \end{bmatrix}$ |
| Toeplitz | TOEP | $\sigma^2$ for i=j,<br>$\sigma_{\lvert i-j\rvert}$ otherwise | $\begin{bmatrix} \sigma^2 & \sigma_1 & \sigma_2 & \sigma_3 \\ \sigma_1 & \sigma^2 & \sigma_1 & \sigma_2 \\ \sigma_2 & \sigma_1 & \sigma^2 & \sigma_1 \\ \sigma_3 & \sigma_2 & \sigma_1 & \sigma^2 \end{bmatrix}$ |
| Toeplitz with two bands (may specify other number of bands) | TOEP(2) | $\sigma^2$ for i=j,<br>$\sigma_{\lvert i-j\rvert}$ otherwise for a given number of bands,<br>0 elsewhere | $\begin{bmatrix} \sigma^2 & \sigma_1 & 0 & 0 \\ \sigma_1 & \sigma^2 & \sigma_1 & 0 \\ 0 & \sigma_1 & \sigma^2 & \sigma_1 \\ 0 & 0 & \sigma_1 & \sigma^2 \end{bmatrix}$ |