IV.B.2. Solving Bayes' Equations: I+Q Inversion Scheme

In matrix notation, the noniterative form of Bayes' equations for the I+Q inversion scheme can be written

$$P' - P = M\left(I+Q\right)^{-1} G^t V^{-1}\left(D-T\right) \qquad \text{(IV B2.1)}$$

and

$$M' = M\left(I+Q\right)^{-1} \quad , \qquad \text{(IV B2.2)}$$

where Q is given by

$$Q = G^t V^{-1} G M \quad . \qquad \text{(IV B2.3)}$$

Although Q (and thus $I + Q$) is not symmetric, nevertheless M' is symmetric. This can be shown by noting that

$$M' = M\left(I+Q\right)^{-1} = M\left(M + M G^t V^{-1} G M\right)^{-1} M \qquad \text{(IV B2.4)}$$

provided that M^{-1} exists. In the form of Eq.(IV B2.4), M' is clearly symmetric.

The inversion of $\left(I+Q\right)$ is found by using NAG [NAG] routine F01AAF. When M' is needed (i.e., for the final iteration), Eq. (IV B2.2) is solved first and the array M' used in Eq. (IV B2.1) to find P'. When M' is not needed, the quantity $\left(I+Q\right)^{-1} G^t V^{-1}\left(D-T\right)$ is first generated and then the multiplication by M is performed. Fewer computer operations and thus faster run time result from performing the multiplications in this order.

As with the N+V inversion scheme, two iterations is the default in SAMMY.

The user has the option to choose which inversion scheme to use (as defined in a command line in the INPut file). If the user makes no choice, SAMMY will choose I+Q or N+V based on which method requires the smaller array size. However, if the data covariance matrix V is neither diagonal nor separable (see Section IV.D.3), then the N+V inversion scheme **must** be used.