Once a solution for λ and μ is obtained, we have

$$\begin{aligned}
w &= -X\begin{pmatrix}\lambda\\ \mu\end{pmatrix} = \sum_{i=1}^p \lambda_i u_i - \sum_{j=1}^q \mu_j v_j\\
b &= -\sum_{i=1}^p \lambda_i + \sum_{j=1}^q \mu_j.
\end{aligned}$$

Note that the constraint

$$\sum_{i=1}^p \lambda_i - \sum_{j=1}^q \mu_j = 0$$

occurring in the dual of Program ($\mathrm{SVM}_{s2'}$) has been traded for the equation

$$b = -\sum_{i=1}^p \lambda_i + \sum_{j=1}^q \mu_j$$

determining b.

If $\nu > (p_f + q_f)/(p+q)$, then η is determined by expressing that the duality gap is zero. We obtain

$$\begin{aligned}
((p+q)\nu - p_f - q_f)\eta = (p_f - q_f)b + w^\top\Bigg(\sum_{j\in K_\mu} v_j - \sum_{i\in K_\lambda} u_i\Bigg)&\\
+ \frac{1}{K_s}\begin{pmatrix}\lambda^\top & \mu^\top\end{pmatrix}\left(X^\top X + \begin{pmatrix}\mathbf{1}_p\mathbf{1}_p^\top & -\mathbf{1}_p\mathbf{1}_q^\top\\ -\mathbf{1}_q\mathbf{1}_p^\top & \mathbf{1}_q\mathbf{1}_q^\top\end{pmatrix}\right)\begin{pmatrix}\lambda\\ \mu\end{pmatrix}&.
\end{aligned}$$

In practice another way to compute η is to assume the Standard Margin Hypothesis for (SVM_{s3}). Under the **Standard Margin Hypothesis** for (SVM_{s3}), either some u_{i_0} is a support vector of type 1 *or* some v_{j_0} is a support vector of type 1. By the complementary slackness conditions $\epsilon_{i_0} = 0$ or $\xi_{j_0} = 0$, so we have

$$w^\top u_{i_0} - b = \eta, \quad \text{or} \quad -w^\top v_{j_0} + b = \eta,$$

and we can solve for η. As in ($\mathrm{SVM}_{s2'}$) we get more numerically stable formulae by averaging over the sets I_λ and I_μ.

Proposition 54.5 gives bounds ν, namely

$$\frac{p_f + q_f}{p+q} \leq \nu \leq \frac{p_m + q_m}{p+q}.$$

In Section 54.11 we investigate conditions on ν that ensure that either there is some blue support vector u_{i_0} *or* there is some red support vector v_{j_0}. Theorem 54.7 shows