

3.3

$$(S_W + \frac{1}{4}S_B)\hat{w} = \frac{\mu_1 - \mu_{-1}}{2}$$

$$S_W \cdot \hat{w} + \frac{1}{4}S_B \cdot \hat{w} = \frac{\mu_1 - \mu_{-1}}{2}$$

$$S_W \cdot \hat{w} + \frac{1}{4}(\mu_1 - \mu_{-1})(\mu_1 - \mu_{-1})^T \cdot \hat{w} = \frac{\mu_1 - \mu_{-1}}{2}$$

$$S_W \cdot \hat{w} = (\mu_1 - \mu_{-1}) \left[\frac{1}{2} - \frac{1}{4}(\mu_1 - \mu_{-1})^T \cdot \hat{w} \right]$$

$$\hat{w} = S_W^{-1}(\mu_1 - \mu_{-1}) \underbrace{\left[\frac{1}{2} - \frac{1}{4}(\mu_1 - \mu_{-1})^T \cdot \hat{w} \right]}_{\tau = \tau}$$