

$$\begin{aligned}\mu_Z &= \int_{\log S} \left(\int_R \exp(\log S (X_b, X_R)) p(R) \, \mathrm{d}R \right) \mathcal{N}(\log S | \mu_{\log S}, \Sigma_{\log S}) \, \mathrm{d} \log S \\ &\approx \int_R \mu_S (1 + \mu_{\Delta_c}) p(R) \, \mathrm{d}R, \text{ where } \Delta_c = \mu_{\log S} - \log \mu_S\end{aligned}$$