

$$Y = X\beta + \varepsilon$$

$$\varepsilon \sim \mathcal{N}(0, I\sigma_\varepsilon^2)$$

$$Y = X\beta + \varepsilon$$

$$\varepsilon \sim \mathcal{N}_n(0, \sigma_g^2 K)$$

$$Y = X\beta + Wu + \varepsilon$$

$$Y = X\beta + g + \varepsilon$$

$$u \sim \mathcal{N}(0, I\sigma_u^2)$$

$$g \sim \mathcal{N}(0, A\sigma_g^2)$$

$$\varepsilon \sim \mathcal{N}(0, I\sigma_\varepsilon^2)$$

$$\begin{aligned} \text{Var}(Y) &= \text{Var}(X\beta + Wu + \varepsilon) \\ &= WW'\sigma_u^2 + I\sigma_\varepsilon^2 \\ &= A\sigma_g^2 + I\sigma_\varepsilon^2 \end{aligned}$$