ST 705 Linear models and variance components
Lab practice problem set 8

March 19, 2024

1. In the simple linear regression model $y_i = \beta_0 + x_i\beta_1 + u_i$ for $i \in \{1, \ldots, n\}$, show that β_0 is estimable **by finding** a vector a and scalar c such that $E(c + a'y) = \beta_0$.

2. Consider the model $Y_{ij} = \mu + \alpha_i + \beta_i x_{ij} + U_{ij}$, for $i \in \{1, \ldots, n\}$ and $j \in \{1 \ldots, m\}$. Further, assume that $\sum_{j=1}^{m}(x_{ij} - \bar{x}_{i\cdot})^2 > 0$ for all $i \in \{1, \ldots, n\}$. Derive the necessary and sufficient conditions for an estimable function $\lambda'\gamma$, where $\gamma := (\mu, \alpha_1, \ldots, \alpha_n, \beta_1, \ldots, \beta_n)'$.