Statistics-III – Assignment 5

1. If columns of X are linearly dependent in the Gauss-Markov model, prove that there is no matrix C such that $C\mathbf{Y}$ is an unbiased estimator of β.

2. Prove that all linear functions $\mathbf{a}'\beta$ are estimable in the Gauss-Markov model iff the columns of X are linearly independent.

3. If $\mathbf{a}_1'\beta$, $\mathbf{a}_2'\beta$, $\ldots$, $\mathbf{a}_1'\beta$ are estimable, prove that any linear combination of these is also estimable (in the Gauss-Markov model).

4. Prove that in the Gauss-Markov model $\mathbf{a}'\beta$ is estimable if and only if $\mathbf{a}'(X'X)^{-}X'X = \mathbf{a}'$.