Chapter 4

Semi-Parametric Estimation in the Linear Model for Correlated Data

In this chapter we consider inference for the parameters of the LMCD without the assumption of multivariate normal errors. We will present a general theory for weighted least squares (WLS) estimators of β, which are consistent and asymptotically normal (CAN), using only the assumption that $E(Y_i) = X_i\beta$. The estimators will be asymptotically efficient as well, provided a consistent estimate of $\mathrm{var}(Y_i)$ is available. We discuss the asymptotic distribution of WLS (and also ML) estimators when $\mathrm{var}(Y_i)$ is misspecified. For simplicity, we will first consider the case where any imbalance is by design so that the expectation $E(Y_i) = X_i\beta$ holds for the observed data and each n_i is fixed. We will discuss imbalance due to missingness at the end of this chapter. We also assume that each $\mathrm{var}(Y_i) = \Sigma_i$ is a function of a finite parameter vector θ. Furthermore, to simplify the presentation we restrict attention to the setting in which the covariates are stochastic, although most of the results described in this section are valid under appropriate regularity conditions when the covariates are assumed to be fixed numbers.