

Inferences for stationary versus non-stationary familial longitudinal data

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Abstract. In a familial longitudinal set up, the familial correlations among the members of a family are introduced through a common random family effect shared by all members, and the longitudinal correlations among the repeated responses of the family members are introduced through a dynamic relationship among the repeated responses. When the covariates associated with the responses are time independent, one may exploit a class of dynamic relationships that produces the same stationary auto-correlation structure. Consequently, this single auto-correlation structure can be used for efficient estimation of the regression parameters (effects of the covariates on the responses) involved in any models under that class of dynamic relationships. If the covariates are time dependent, then the longitudinal correlation structures become non-stationary and they vary in their forms depending on the form of the dynamic relationship used to construct the model. The purpose of this paper is to examine the effects of using a single stationary auto-correlation structure on the estimation of the regression parameters, variance of the random family effects (also known as familial correlation index parameter), and the longitudinal correlation index parameter, when in fact it is known that the true longitudinal correlation structure is non-stationary. This inference problem is studied for both familial longitudinal count and binary data. Small sample properties of the estimators are studied through two simulation studies, one for the count data case and the other for the binary set up. The drawbacks and the advantages of the proposed estimation approach are illustrated by analysing a familial and longitudinal count data consisting of the number of visits to the physician by members of 36 families for a period of 6 years, collected by the General Hospital of St. John's, Canada.