Analysis of longitudinal data has increased in popularity in recent years for several disciplines because it helps to understand the dynamic nature and the heterogeneity within and among subjects. There has been a much more rapid progress of longitudinal analysis for univariate data (e.g. Frees et al. (1999) and Shi and Frees (2010) in actuarial science). However, there is a developing interest of extending the longitudinal framework to handle multivariate responses (e.g. Shi (2011)) for obvious reasons: to capture dependence structure of the responses and thereby to increase the efficiency of the model. Actuarial applications in this area are very limited at the moment and it is our hope to contribute to this developing literature. Most work has focused on the assumption of multivariate normal for the joint responses. We propose a more flexible framework of using copula functions to integrate the presence of dependence among responses and the use of classical random effects approach to identify intertemporal dependence within a subject and unobservable subject-specific heterogeneity among observations. Covariate information is taken into account for observable subject-specific effects through the generalized linear regression model for the marginals. Our proposed method can be used to analyse both balanced and unbalanced data, an important aspect of longitudinal investigation. For empirical illustration, we analyze a dataset to understand global insurance demand, with the responses broken into life and non-life insurance.

Keywords: Longitudinal analysis, dependence, copulas, random effects models.