Abstract

Since the beginning of the 20th century, the human beings have been experiencing longer life expectancy and lower mortality rates, which can attributed to constant improvements of factors such as medical technology, economics, and environment. The prolonging life expectancy has dramatically changed the life planning and life style after the retirement. The change would be even more severe if the mortality rates have larger reduction, and thus the study of mortality become popular in recent years. Many methods were proposed to describe the change of mortality rates. Among all methods, the Age-Period-Cohort model (APC) is a popular method used in epidemiology to discuss the relation between diseases, mortality rate, age, period and cohort.

Non-identification (i.e. collinearity) is a serious problem for APC model, and many methods used in the procedure included estimation of parameter. In the first part of this paper, we use simulation compare and evaluate popular estimation methods of APC model, such as Intrinsic Estimator (IE), constrained of age, period and cohort in the Generalized Linear Model (c−glim), sequential method, and Auto-regression (AR) Model. The simulation methods considered include Monte-Carlo and cross validation. In addition, the morality data in Taiwan (Data sources: Ministry of Interior), are used to demonstrate the validity and model assumption of these methods. In the second part of this paper, we also apply similar research method to the Lee-Carter model and compare it to the APC model. We found Lee−Carter model have smaller prediction errors than APC models in the cross−validation.

Key words: Age−Period−Cohort Model, Generalized Linear Models, Intrinsic Estimator, Mortality Rates Models、Simulation