Spatial Variability in Mortality and Socioeconomic Factors for Australian Mortality

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Abstract

Mortality rates are known to vary by geographical location and to depend on socio-economic factors. Demographic, ethnic and socio-economic mortality factors vary by geographical location. Regions that are in closer proximity are expected to have similar mortality because of similar socio-economic factors and demographic characteristics. In this paper the spatial variability of Australian mortality is assessed using a spatial model along with explanatory risk factors including age, income, labour force participation and unemployment rate. Geographical variation is based on statistical subdivisions, areas of similar social and economic backgrounds. Logistic regressions are estimated using an hierarchical Bayes model with Markov Chain Monte Carlo methods for mortality rates in 208 statistical subdivisions in Australia for census years 1996, 2001 and 2006. Spatial models explain mortality variation by geographical location better than non-spatial models when limited data is available for socio-economic factors. Explanatory factors, which also vary spatially, reduce the need for spatial models for mortality. The modeling has implications for pricing and risk management in life insurance companies. Geographical variation in risks can be quantified using spatial models especially if there is limited data for risk factors that generate mortality heterogeneity. Employment and workforce participation, ethnic background as well as income are found to be significant in explaining mortality variation by geographical location in Australia. Geographical location has been used recently in the UK based on postcode in pricing and risk management of mortality and longevity risk products. As demonstrated in this paper, spatial geodemographic models should be of significant interest to insurers in assessing mortality risk.

Keywords: Mortality, Logistic regression, Geodemographic, Spatial, Hierarchical Bayes

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