

Modeling Heat-Related Mortality Based on Greenhouse Emissions in OECD Countries

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Abstract : Greenhouse emissions by human activities are known to irreversibly increase global temperatures through the greenhouse effect. This study seeks to propose a mortality model with sensitivity to heat-change effects as one of the underlying parameters in the model. As such, the study sought to establish the relationship between greenhouse emissions and mortality indices in five OECD countries (USA, UK, Japan, Canada & Germany). Upon the establishment of the relationship using correlation analysis, an additional parameter that accounts for the sensitivity of heat-changes to mortality rates was incorporated in the Lee-Carter model. Based on the proposed model, new parameter estimates were calculated using iterative algorithms for optimization. Finally, the goodness of fit for the original Lee-Carter model and the proposed model were compared using deviance comparison. The proposed model provides a better fit to mortality rates especially in USA, UK and Germany where the mortality indices have a strong positive correlation with the level of greenhouse emissions. The results of this study are of particular importance to actuaries, demographers and climate-risk experts who seek to use better mortality-modeling techniques in the wake of heat effects caused by increased greenhouse emissions.

Keywords : climate risk, greenhouse emissions, Lee-Carter model, OECD

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