

UNIVERSITI TEKNOLOGI MARA

**GENDER AND COUNTRY SPECIFIC
COHERENT MORTALITY MODEL:
ESTIMATING THE NEW
MALAYSIAN ANNUITY FACTORS**

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ABSTRACT

This study aims to forecast Malaysian mortality rates by age and gender using the Product-Ratio Coherent model and the widely used of the Lee-Carter model. There are two types of Product-Ratio Coherent model which are Product Ratio Coherent Model-Gender Coherence and Product Ratio Coherent Model-Developed Country Coherence. These models will be fitted into the mortality data and the in-sample and out-sample errors will be evaluated, then estimate the annuity factors for Malaysian population using the mortality forecast values based on the most accurate model. Data for Malaysia is obtained from the Department of Statistics Malaysia (DoSM) whereas the data for selected developed countries of Australia, United Kingdom and Japan accessible from Human Mortality Database. Two different sets of fitting periods were determined based on the observations of changes in mortality index patterns over the years for the Lee-Carter model that are set A consists of fitting period from 1970 to 1993 whereas set B from 1970 to 2000. Whereas the Product-Ratio Coherent model used fitting period from the year 1970 to 2000. The in-sample evaluation of the Lee-Carter model and Product Ratio Coherent Model-Gender Coherence are performed using the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) whereas the out-sample errors are calculated using the Mean Absolute Percent Errors (MAPE) and Root Mean Square Error (RMSE). Results show that Product Ratio Coherent Model-Developed Country Coherence between Malaysia and Japan is outperformed to forecast the mortality rates of Malaysian males while Product Ratio Coherent Model-Developed Country Coherence between Malaysia and Australia, and Malaysia and United Kingdom is the best model to forecast the mortality rates of Malaysian females by having lower values of MAPE and RMSE. An estimation on annuity factors is calculated using the data of general Malaysia population and new annuity table for the year 2018 and 2030 is created. Having a newly projected annuity table is important in to order to help the government and insurance companies towards more accurate annuity product pricing, ensuring future sustainability.

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