

A Credibility Regression Approach with Randomly Varying Coefficients to Age-Specific Mortality Modelling

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Abstract

In this paper, we model and forecast mortality dynamics of a given population within the framework of regression credibility. More specifically, age-specific mortality rates are modelled using a modification of regression settings with randomly varying coefficients and forecasting performance is compared with the most widely used Lee-Carter variations. All these approaches are applied to the Greek population dataset to obtain a complete illustration of comparison results.

Keywords: Credibility regression model, random coefficients, hierarchical credibility, mortality models, Greece.

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References

- [1] Bühlmann, H. and Gisler, A. (2005). *A course in credibility theory and its applications*. The Netherlands: Springer.
- [2] Goovaerts, M. J. and Hoogstad, W. J. (1987). *Credibility Theory*. Nationale-Nederlanden, N. V.
- [3] Goovaerts, M. J., Kaas, R., Van Heerwaarden, A. E., and Bauwelinckx, T. (1990). Effective actuarial methods.
- [4] Hachemeister, C. (1975). Credibility for Regression Models with Application to Trend (Reprint). In Kahn, P., editor, *CREDIBILITY: Theory and Applications*, pp. 307-348. Academic Press, Inc.

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- [5] Hildreth, C. and Houck, J. P. (1968). Some Estimators for a Linear Model with Random Coefficients. *Journal of the American Statistical Association*, **63**(322), pp. 584-595.
- [6] Raj, B. and Ullah, A. (1981). *Econometrics: A Varying Coefficients Approach*. Routledge Revivals.
- [7] Tsai, C. C.-L. and Lin, T. (2016). Incorporating the Bühlmann credibility into mortality models to improve forecasting performances. *Scandinavian Actuarial Journal*, **2017**(5), pp. 419-440.
- [8] Tsai, C. C.-L. and Lin, T. (2017). A Bühlmann credibility approach to modeling mortality rates. *North American Actuarial Journal*, **21**(2), pp. 204-227.