

Spatio-Temporal Models for Rates and Survival Analysis

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The development of methods for spatio-temporal analyses has seen tremendous growth over the last two decades. There has also been considerable impact on determining spatial differences in diseases, for monitoring and surveillance purposes, and for allocating differential health funding to regions. Much of this literature, though relevant to actuarial policy, has been focused in the health policy fields. This talk aims to relieve this gap by introducing spatial-temporal models and methods for analysis with specific emphasis on quantities of interest in actuarial science: spatio-temporal analysis of rates and spatio-temporal survival analysis. Generalized additive mixed models are used for the analysis of geographic and temporal variability of mortality rates. This class of models accommodates random spatial effects and fixed and random temporal components. Spatiotemporal models that use autoregressive local smoothing across the spatial dimension and B-spline smoothing over the temporal dimension are developed. The objective is the identification of temporal trends and spatial patterns of risks. Regions with consistently high risk estimates may be identified through such analyses for differential policy implications. The emphasis of the presentation is on concepts underpinning analyses which describe and contrast the spatial distribution of rates over a region, and the use of illustrative examples to display such distributions.