
In-sample forecasting with local linear survival densities - A continuous chain ladder approach

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Abstract. In this paper, in-sample forecasting is defined as forecasting a structured density to sets where the density is not observed. The structured density consists of one-dimensional in-sample components that identify the density on such sets. This paper focuses on the multiplicative density structure that recently has been seen as the underlying structure of non-life insurance forecasts. In non-life insurance the in-sample area is defined as one triangle and the forecasting area as the triangle that added to the first triangle produces a square. Recent approaches estimate two one-dimensional components by projecting an unstructured two-dimensional density estimator on a multiplicative space. This paper shows that a simple time reversal reduces the problem to two one-dimensional problems, where the one-dimensional data are left-truncated and a one-dimensional survival density estimator is needed. This paper then uses the local linear density smoother, with a weighted cross-validated and do-validated bandwidth selector. Finite sample studies and a real life application to non-life insurance is included to illustrate these techniques in practice.

Keywords. Aalen's multiplicative model; Density estimation; Local linear kernel estimation; Survival data; Chain ladder
