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# **An Actuarial Framework for Modeling Loss Cost Ratio's in Crop Insurance: Trend Testing, Data Detrending, and Pricing, Using an Erlang Mixture Distribution**

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In the design and rating of crop insurance products, it is crucial to gain confidence surrounding the underlying trending process of the data, and remove the trends accordingly. This helps to ensure that the loss models can be constructed more scientifically, which promotes actuarial risk management and pricing. The objective of this study is to review by simulation the current tools available for testing trends in time series. Further, this study constructs and compares alternative probability distribution models, using a unique and comprehensive data set that represents the entire crop insurance sector of Canada. The focus of this study is on a unique aggregate level data set comprised of actual indemnities and liabilities from 1979 through 2010, across 276 crop types, and 10 geographic regions in Canada. From this, the loss cost ratio's are calculated in order to normalize the loss exposure, due to significant increases in liabilities and yields observed over time. In this study, a family of Erlang mixture distributions, which is shown to capture the tails of the data far better than conventional distributions is proposed. Preliminary results also show that the Erlang distribution performs well in forecasting. Moreover, the models' predictive power can be further improved using the resulting Erlang mixture distribution, and constructing a forecasting model using credibility theory.